ENCYCLOPÆDIA BRITANNICA;

OR, A

DICTIONARY

OF

ARTS, SCIENCES,

AND

MISCELLANEOUS LITERATURE;

Conſtructed on a PLAN,

BY WHICH

THE DIFFERENT SCIENCES AND ARTS

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TREATISES OR SYSTEMS,

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AND FULL EXPLANATIONS GIVEN OF THE

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AND

An Account of the LIVES of the moſt Eminent Perſons in every Nation,
from the earlieſt ages down to the preſent times.

Compiled from the writings of the beſt Authors, in ſeveral languages; the moſt approved Dictionaries, as well of general ſcience as of its particular branches; the Tranſactions, Journals, and Memoirs, of Learned Societies, both at home and abroad; the MS. Lectures of Eminent Profeſſors on different ſciences; and a variety of Original Materials, furniſhed by an Extenſive Correſpondence.

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ENCYCLOPÆDIA BRITANNICA.

M E D A L S.

Utility of them in History, &c.

MEDAL, denotes a piece of metal in the form of coin, such as was either current money among the ancients, or struck on any particular occasion, in order to preserve to posterity the portrait of some great person, or the memory of some illustrious action. Scaliger derives the word *medal* from the Arabic *methalia*; a sort of coin with a human head upon it. But the opinion of Vossius is generally received; viz. that it comes from *metallum*, "metal;" of which substance medals are commonly made.

Sect. I. *Utility of Medals in History, and various other Sciences.*

There are few studies of more importance to history than that of medals; the sole evidence we can have of the veracity of an historian being only such collateral documents as are evident to every body, and cannot be falsified. In modern times, these are found in public memoirs, instructions to ambassadors, and state papers of various kinds. Such memorials, however, are subject to various accidents, and besides commonly remain in the countries where they are first published, and cannot therefore give to the world at large that perfect and entire satisfaction which ought to be derived from genuine history; so that more durable and widely diffused monuments are still to be wished for. Such are public buildings, inscriptions, and statues; but these, excepting a few instances of the two last, are always confined to particular countries; so that medals alone remain as infallible documents of truth, capable of being diffused over all countries in the world, and of remaining through the latest ages.

1 Various writers on medals.

The first who showed the importance of medals in ascertaining the dates, and arranging the order of events, in ancient history, by means of medals, was Vaillant, in his History of the Kings of Syria, printed at Paris in 1681. By medals alone, he has been enabled to fix the chronology and important events of history, in the three most ancient kingdoms of the world, viz. Egypt, Syria, and Parthia. Many coins have been discovered since his time, which confirm the accounts he has given. He was followed in this method by Father Hardouin, though with less success. Hardouin's best work is his *Herodiades*, or Series of Successors to Herod king of Judæa. The same plan was pursued by Noris, in his learned Treatise on the Syro-Macedonian princes, and by Bayer in his History of Osrhoene, as well as by Froelich, in the work intitled *Annales Regum et Rerum Syriæ*, Vien. 1754, and another named Kevenhullers *Regum veterum Numismata Anecdota aut Perrara*, Vien. 1752, 4to, of which Froelich was properly the author. Corsini and Cary likewise published works of a similar nature; the former in 1744, *De Minnisari, aliorumque Armeniæ Regum, Nummis*, &c.; the latter in 1752, *Histoire des Rois de Thrace, et du Bosphore Cimmerien, eclaircie par les Medailles.*

2 Of the Greek coins.

The study of the Greek coins does not show the dates of events, though it illustrates the chronology of reigns. This defect, however, is abundantly supplied by those of Rome, which commonly mark the date of the prince's consulship, the year of his tribunician power; giving also, upon the reverse, the representation or poetical symbol of some grand event. The year of the tribunician power is sometimes imagined by antiquaries to be synonymous with that of the emperor's reign: but this is not the case; and Mr Pinkerton is at some pains to set them right in this respect. He finds fault with Julius Cæsar, when he assumed the sovereign authority, for taking upon him the title of Perpetual Dictator, as being synonymous with that of king or absolute governor, which the Romans abhorred. "He ought (says our author), under the disguise of some supreme magistrate of annual election, to have lulled the people with a dream, that they might terminate his power when they pleased; or that he himself would resign it, when the necessities of state which had required his temporary elevation had subsided." To this error Mr Pinkerton ascribes the assassination of the Dictator, and commends the policy of Augustus, who, with far inferior abilities, continued in possession of the most absolute authority as long as he lived. The tribuneship was an office of annual election; and if put into the hands of any others than plebeians, must have been the supreme power of the state, as it belonged to that office to put a negative upon every public measure whatever. Augustus, being of senatorial rank, could not assume this office; but he invested himself with the tribunician power, which had the advantages of appearing to be only a temporary supremacy, though in truth it was continued during his whole lifetime. Towards the end of his reign, he frequently assumed his destined successor, Tiberius, for his colleague, though in the beginning he had enjoyed it alone. This, with his artifice of resigning his power every ten years, and

3 Method used by Augustus to secure his power.

Utility of them in Hiſtory, &c.

re-aſſuming it at the deſire, as was pretended, of the ſenate, ſecured his ſovereignty as long as he lived.— His example was followed by his ſucceſſors; ſo that moſt of them have the inſcription *Tribunicia Poteſtate* upon their medals, with the date affixed to it thus, *Tr. Pot.* VII. Yet though this date generally implies the year of the emperor's reign, it ſometimes happens that the emperor, by ſpecial favour from a former prince, had been endowed with this title before he came to the throne, as being the ſucceſſor to that prince, of which we have already given an inſtance in Tiberius. Beſides the tribunician power, the emperors very frequently enjoyed that of the conſuls; and the date of their conſulſhip is frequently expreſſed in their coins.

The office of Pontifex Maximus was likewiſe aſſumed by the Roman emperors in order to ſecure themſelves in their authority; which, Mr Pinkerton obſerves, was one of the moſt efficacious artifices they could have fallen upon. "In the Greek heroic times (ſays he), king and prieſt were carefully united in one perſon; and when ſovereigns aroſe in Denmark and Sweden, the ſame plan was followed, as appears from Snorro, and other writers. Nothing could lend more ſecurity to the perſon of the monarch than an office of ſupreme ſanctity, which alſo confirmed his power by all the terrors of ſuperſtition. Even the Chriſtian ſyſtem was afterwards debaſed by a mock alliance with government; though it be clear from the whole New Teſtament, that ſuch an alliance is ſubverſive of its genuine inſtitution, and the greateſt of all its corruptions. But the Roman Catholic clergy, in the dark ages, were the authors of 'no church no king,' for their own intereſt; while the Roman emperors only ſought to ſtrengthen their power by the dark awe of ſuperſtition. The title of Pontifex Maximus was ſo important, that it was retained even by the Chriſtian emperors till the time of Gratian. Its influence in the ſtate was, indeed, prodigious. Cicero obſerves, that to this office were ſubject temples, altars, penates, gods, houſes, wealth, and fortune of the people.— That of augur is alſo borne by many emperors; and its authority was ſuch, that by the law of the twelve tables no public buſineſs could be tranſacted without a declaration from the augur concerning its event.— The pro-conſular power was alſo given to Auguſtus and the other emperors. It conferred a direct authority over all the provinces, and implied the emperor to be chief pro-conſul, or governor of each, and of all. Another ſpecial power aſſigned to the emperors, but not occurring on coins, was the *Jus Relationis Tertiæ, Quartæ*, &c. or the right of making three or four motions in the ſenate on the ſame day, while the ſenators could only propoſe one.

Hence our author infers, that medals afford the moſt authentic documents of the Roman hiſtory, in particular, that could have been invented by man.— The hiſtories of Nerva and Trajan are much better elucidated by medals than by authors; for the hiſtory of Suetonius ends with Domitian, and the *Hiſtoriæ Auguſtæ Scriptores* begins with Adrian: ſo that the reigns of the two emperors juſt mentioned are almoſt unknown; and Mr Pinkerton is ſurpriſed that none of the learned have attempted to ſupply the defect.— "Capitolinus (ſays he), in his life of Maximinus Junior, is quite puzzled to know if Maximus and Pupienus were two emperors, or two names for the ſame. Had he happened on any of thoſe coins which bear M. CL. PUPIENUS MAXIMUS AUG. he would have ſeen at once that Maximus was only another name for Pupienus."

4 Uſe of medals in geography.

Medals are uſeful in other ſciences beſides hiſtory. In geography, we find the ſituation of towns determined by their vicinity to ſome noted river, mountain, &c. Thus, ΜΑΓΝΗΤΩΝ ΣΙΠΥΛΟΥ ſhows that Magneſia was ſituated under Mount Sipylus. In like manner, it is ſhown from a medal, that Epheſus ſtood on the river Cayſter; and there is extant a medal, bearing an inſcription, which ſignifies Alexandria on the Scamander; a name given to Troy by Alexander the Great. The reverſe has upon it the famous Apollo Smintheus of Homer. In natural hiſtory, alſo, medals are uſeful chiefly from the coins ſtruck on the celebration of the ſecular games, in which the figures of various animals are preſerved; and thus it may very often be determined whether any animal be known to the ancients or not. On many of the Greek medals are ſeveral uncommon plants and animals. Thus, on moſt of the medals of Cyrene is the figure of the celebrated *Sylphium*; and on thoſe of Tyre, the ſhell-fiſh from which the famous Tyrian purple was procured. By means of medals, alſo, the exact delineations of many noble edifices are preſerved, though not even a veſtige of their ruins be now exiſting; ſo that the uſes of them to the architect are very conſiderable. To the connoiſſeur they are abſolutely neceſſary; becauſe by them alone he is enabled to aſcribe ancient buſts and ſtatues to their proper perſons, with multitudes of other points of knowledge which cannot be otherwiſe determined. The elucidations of obſcure paſſages in ancient authors by means of medals are ſo numerous and well known, that it is needleſs to inſiſt upon them.

5 In natural hiſtory.

6 In architecture.

7 In the fine arts.

Mr Addiſon has treated the connection betwixt medals and poetry at conſiderable length; but Mr Pinkerton finds fault with him for preferring the Latin to the Greek poets. He obſerves alſo, that the knowledge of Greek medals is moſt neceſſary for a ſculptor, and perhaps an architect; but an acquaintance with Latin ones is preferable for a poet, or perhaps a painter. The reaſon of this difference is, that the former generally have on the obverſe the head of ſome king, god, or goddeſs, of exquiſite relief and workmanſhip; but the reverſe ſeldom affords much fancy of ſymbol in the early Greek coins; and in the imperial Greek coins, is chiefly impreſſed with the temples of their deities. To a perſon of poetical imagination, however, the Roman coins afford the greateſt entertainment, from the fine perſonifications and ſymbols to be found on their reverſes; of which our author gives the following inſtances:

8 Latin medals of uſe to a poet.

9 Perſonifications on Roman medals.

"HAPPINESS has ſometimes the caduceus, or wand of Mercury, which Cicero, 1. *Offic.* tells us was thought to procure every wiſh. She has in a gold coin of Severus heads of poppy, to expreſs that our prime bleſs lies in oblivion of misfortune.

"HOPE is repreſented as a ſprightly girl, walking quickly, and looking ſtraight forward. With her left hand

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hand ſhe holds up her garments, that they may not impede the rapidity of her pace; while in her right hand ſhe holds forth the bud of a flower; an emblem infinitely more fine than the trite one of an anchor, which is the ſymbol of Patience and not of Hope. This perſonification, with ſome others, muſt have been very familiar to the ancients; for often in this, and in a few more inſtances, no name, as SPES AUG. or the like, is inſerted in the legend.

"ABUNDANCE is imagined as a ſedate matron, with a cornucopia in her hands, of which ſhe ſcatters the fruits, and does not hold up her cornucopia and keep the contents to herſelf, as many modern poets and painters make her do.

"The Emperor Titus, having cauſe to import a great ſupply of corn during a ſcarcity at Rome, that ſupply, or the ANNONA, is finely repreſented as a ſedate lady, with filled cornucopia in her left hand, which ſhe holds upright, to indicate that ſhe does not, however, mean to ſcatter it, as Abundance has a title to do, but to give it to Equity to deal out. This laſt particular is ſhown by her holding a little image of Equity, known by her ſcales and *haſta pura*, or pointleſs ſpear, in her right hand, over a baſket filled with wheat. Behind the ANNONA is the prow of a ſhip decked with flowers, to imply that the corn was brought by ſea (from Africa), and that the ſhips had had a proſperous voyage. The beſt poet in the world would not have given us a finer train of imagery; the beſt painter would have been puzzled to expreſs ſo much matter in ſo ſmall a compaſs.

"SECURITY ſtands leaning upon a pillar, indicative of her being free from all deſigns and purſuits; and the poſture itſelf correſponds to her name. Horace, in deſcribing the wiſe man, mentions his being *teres atque rotundus*; round and poliſhed, againſt all the rules of chance: an idea ſeemingly derived from the column upon which this ideal lady reclines.

"The emblems of PIETY, MODESTY, and the like, are equally appoſite and poetical.

"The happineſs of the ſtate is pictured by a ſhip ſailing before a proſperous breeze: an image than which the ſuperlative genius of Gray could find none more exquiſite; and he has accordingly uſed it in his moſt capital production "The Bard," with due ſucceſs.

"The different countries of the then known world are alſo delineated with great poetical imagery. It affords patriotic ſatisfaction in particular to a Briton, to ſee his native iſland often repreſented upon the earlieſt imperial coins ſitting on a globe, with a ſymbol of military power, the *labarum* in her hand, and the ocean rolling under her feet. An emblem almoſt prophetic of the vaſt power which her dominion over the ſea will always give her, provided ſhe exerts her element of empire with due vigour and perſeverance.

"Coins alſo preſent us with Achaia, Africa, Alamannia, Alexandria, Arabia, Armenia, Aſia, Bithynia, Cappadocia, Dacia, Dardania, Egypt, Gallia, Hiſpania, Italia, Judæa, Macedon, Mauritania, Pannonia, Parthia, Phrygia, Sarmatia, Sicily, Scythia, Syria, and the rivers Danube, Nile, Rhine, Tyber. This perſonification of provinces ſeems to have ariſen from the figures of provinces carried in triumphs; as the perſonification of our old poets ſprung from the ideal perſons actually repreſented in the myſterial plays.

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"There is one colonial medal of rude execution of Auguſtus and Agrippa, which has an high claim to merit in diſplaying the ancient poetical imagery. It is inſcribed IMP. and DIVI. F. and on the reverſe, the conqueſt of Egypt is repreſented by the metaphor of a crocodile, an animal almoſt peculiar to that country, and at that period eſteemed altogether ſo; which is chained to a palm-tree, at once a native of the country, and ſymbolic of victory.

To Medals uſeful to a painter.

"As the reverſes are ſo uſeful for knowledge of perſonification, ſymbols of countries and actions, and the like; ſo the portraits to be ſeen on old coins are no leſs important to a painter; the high merit of a great number of them, in every character, juſtly intitling them to be regarded as the beſt ſtudies in the world. Not to mention, that, to an hiſtoric painter, the ſcience of ancient medals is abſolutely neceſſary, that he may delineate his perſonages with the features they really bore while in exiſtence. This can only be attained in this way, or from ſtatues and buſts; any one of which will coſt as much as hundreds of medals; and indeed a collection of ſuch is only attainable by princes."

To a ſculptor.

The ſame things which render the ſtudy of medals important to a painter, do ſtill more ſo to a ſculptor; and in this particular, the ſtudy of the Greek coins is remarkably uſeful. The ſkill of the Greeks in the art of ſculpture has always been admired throughout the world; and on their coins the heads of ſeveral deities are repreſented in the moſt exquiſite *alto-relievo*. Our author therefore thinks it ſtrange, that the Grecian coins ſhould have hitherto been ſo little attended to by men of learning and taſte. They may have been looked upon, he ſuppoſes, as belonging only to the province of the antiquary; but he aſſures us, that the Greek medals will afford ſatisfaction to the perſons who value them only as pieces of workmanſhip. In moſt reſpects, they greatly excel thoſe of Rome even in its beſt times; which our author ſuppoſes to have been from the days of Auguſtus to Adrian. "In the days of Adrian, in particular (ſays he), the Roman mint ſeems to have been the very ſeat of art and genius; witneſs the vaſt number of exquiſite perſonifications, engraven with equal workmanſhip, which ſwarm on the medals of that prince. Yet from his time down to Poſthumus, coins of admirable workmanſhip are to be found. Thoſe of the Fauſtinas and Lucilla deſerve particular mention. There is one, and not an uncommon one, of the latter in great braſs, which yields to nothing of the kind. The reverſe is a Venus with the name around her. The portrait of the obverſe ſeems to ſpring from the field of the coin; it looks and breathes, nay talks, if you truſt your eyes. The coins of Tarſus are extremely remarkable for a kind of perſpective in the figures, as Froelich obſerves. On others are found triumphal arches, temples, fountains, aqueducts, amphitheatres, circi, hippodromes, palaces, baſilicas, columns and obeliſks, baths, ſea-ports, pharoſes, and the like. Theſe furniſh much pleaſure and inſtruction to the architect, and ſerve to form his taſte to the ancient manner; that manner which unites perfect ſimplicity with ſublimity and grace; that manner which every

Entertainment from studying them.

age admires, in proportion as it has genius to imitate."

Sect. II. *Entertainment arising from the Study of Medals.*

Besides the purposes which the study of medals answers in the useful arts, a great variety of sources of entertainment are to be found in it. Mr Pinkerton observes, that the most barbarous nations are more pleased with the rudest efforts of art, than with the most admirable works of nature; and that in proportion as the powers of the mind are large and various, such are also the pleasures which it receives from those superlative productions of art, which can only be the offspring of vast genius. Hence works of art are agreeable both to the enlightened and to the ignorant. The chief amusement, therefore, which attends the study of medals, originates from the strength and spirit, the finish and beauty, which the engraver has displayed in the execution of them. It besides gives a kind of personal acquaintance with the persons of whom they are the representations. Portraits have always been highly entertaining to mankind; and our author is of opinion, that the love of them gave rise both to painting and sculpture. They are no where to be found so ancient, numerous, and so well preserved as in medals. Amusement is also derived even from the representations of ideal heads and persons; nay, even from the minutest symbols. Thus the Greek coins of cities present us with heads of deities of exquisite workmanship, apparently copied from statues or paintings; so that we may even guess at the works of Apelles and Praxiteles from some of the Greek medals. Their reverses afford still greater variety; there being scarce an object either in art or nature which is not represented upon some of them: and to the satisfaction arising from a view of these, we may likewise add that of beholding, in a lively manner, the dresses, manners and customs, religious and civil ceremonies, of the ancients: so that from medals we may obtain an interesting history of manners; which, though very lately cultivated, may perhaps afford the most useful and entertaining of all the provinces of history.

11 Difference betwixt a medallist and antiquary.

There is a very considerable difference betwixt the study of medals and that of a mere antiquary. The latter frequently seems to take delight in coins merely in proportion to their rust and deformity; so that it is often a recommendation of some of their pieces, that neither portrait, reverse, nor legend, can be discovered; at least in such manner as can be intelligibly explained. "The delight of the antiquarist (says Mr Pinkerton) may be called a depraved appetite of the mind, which feeds on trash, and fills itself with emptiness. It is perhaps a mere childish curiosity mingled with caprice and hypochondricism. Against this character the ridicule of Severus is particularly shot, but with little effect; for our antiquists exceed in visions and nonsense. I say *antiquists*; for the name of antiquary is sacred. By *antiquary*, in foreign countries, is implied a man who illustrates their ancient laws, manners, poetry, but especially their ancient history. There, men of the most elevated minds are antiquaries; as Muratori, Leibnitz, Montesquieu, Du Bos. Here men of talents will not stoop, forsooth, to studies the most important to their country, but leave its antiquities to chance. Every thing is important but our history; and we are profound in every ancient matter that is superficial; and superficial in what is profound. Even England cannot boast of one general historian, but trusts to the inaccuracy of Rapin, and the ignorant neatness of Hume. It is therefore no wonder that the study of antiquity is here ridiculous, though most important in other countries; none requiring greater talents, learning, or industry. But the historic antiquary has the pleasure of benefiting society, and enlightening whole nations, while the medallic has only an innocent amusement. This amusement, considered merely as rising from antiquarian objects, has not been explained, though felt by most people, and more by the learned. It seems analogical with that which we derive from an extensive prospect: for as the mind delights to expand itself into distant places, so also into distant times. We connect ourselves with these times, and feel as it were a double existence. The passions are singularly affected by minute circumstances, though mute to generalities; and the relicts of antiquity impress us more than its general history."

History.

Sect III. *History of Medals.*

The study of medals is not of very ancient date: None of the classic writers give any account of collections of them; though indeed many little particulars are passed without notice by them. In the times of the Greeks, a collection of such coins as then existed must have been but little regarded, as consisting only of those struck by the numerous little states which at that time used the Greek characters and language. Hence they would have had an air of domestic coinage, and no attention would have been paid to them, however exquisite their workmanship might have been. The little intercourse at that time carried on betwixt the different provinces also, greatly impeded any communication of knowledge to those who wrote histories; so that it is no wonder to find any small collections that might then have existed altogether unnoticed by them.

13 Greek coins imitated by the Romans.

Almost as soon as any communication was opened between the Greeks and Romans, the latter treated the arts of the Greeks with all due respect and applause. Their coins were imitated by the Romans, and preserved in cabinets by the senators among their choicest treasures. Suetonius informs us, that on solemn occasions Augustus was accustomed to present his friends with medals of foreign states and princes, along with other valuable testimonies of his friendship. In a more advanced period of the Roman empire, however, individuals would undoubtedly form collections of coins peculiar to their own state; for Dr Stukeley, in his Medallic History of Carausius, informs us, that a complete series of silver coins was lately found in Britain, containing all the emperors down to Carausius inclusively. From Banduri we also know, that certain Greek coins were specially preserved by the Romans; and it appears from their code, that ancient gold and silver coins were made use of instead of gems; to which distinction those of Sicily were particularly intitled. From the decline of the Roman empire till towards the end of the 5th century, History. ry, almost all branches of literature were involved in darkness, and the medallic science among the rest. While the Christian dominion of Constantinople lasted, indeed, almost all the arts and sciences may be said to have been kept within its own boundaries; though the Arabs and eastern nations had some arts and sciences of their own: but after the destruction of the imperial city by the Turks, the Greeks were once more compelled to become fathers to the European Science. Even before this time, indeed, some vestiges of a revival of literature had appeared in Italy; "and so intimate and necessary a connection (says Mr Pinkerton) has now the study of medals with that of ancient erudition, that on the earliest appearance of a revival of the latter, the former was also disclosed."

14 Collectors of medals. The first among the moderns who began to study the medallic science was Petrarch. Being desired by the Emperor Charles IV. to compose a book containing the lives of eminent men, and to place him in the list, he replied, that he would do so whenever the emperor's life and conduct deserved it. In consequence of this conversation he afterwards sent the emperor a collection of gold and silver coins bearing the representations of eminent men, with an address suitable to his former declaration. A collection of coins was made in the next age by Alphonso king of Arragon; but though this monarch collected all that could be found throughout Italy, we know that there could not have been very many, as the whole were contained in an ivory cabinet, and carried always about with him. A very considerable collection was made by Anthony Cardinal St Mark, nephew to Eugene IV. who ascended the pontifical chair in 1431; and soon after the grand museum at Florence was begun by Cosmo de Medici, where a collection of ancient coins and medals had a place among other curiosities. Corvinus king of Hungary about the same time formed a noble collection of coins along with ancient manuscripts and other valuable relicts of antiquity.

Mr Pinkerton considers Agnolo Poliziano, more commonly known by the name of *Angelus Politianus*, as the first writer who adduced medals as vouchers of ancient orthography and customs. He cites different coins of the Medicean collection in his Miscellanea written about the year 1490. By means of a cabinet of medals collected by Maximilian I. emperor of Germany, Joannes Huttichius was enabled to publish a book of the lives of the emperors, enriched with their portraits, delineated from ancient coins. It is generally supposed that this book, which appeared in 1525, was the first work of the kind; but Labbe, in his *Bibliotheca Nummaria*, mentions another named *Illustrium Imagines*, by one Andreas Fulvius, printed in 1517, in which most of the portraits seem to be from medals. About the year 1512 also, Guillaume Bude, a French author, had written his treatise *De Asse*, though it was not printed till many years afterwards. M. Grollier, treasurer of the French armies in Italy, during part of the 16th century, had a great collection of coins of different kinds of metals. After his death, his brass medals were sent to Provence, and were about to be sent into Italy; when the king of France, having got information of the transaction, gave orders to stop them, and purchase the whole at a very high price for his own cabinet of antiquities. M. Grollier had an assortment of gold and silver as well as of brass medals: the cabinet in which they were contained fell two centuries afterwards into the hands of M. L'Abbe de Bothelin; and was known to have been that of Grollier from some slips of paper, on which was his usual inscription for his books, *Joannis Grollierii, et amicorum.*

15 Number of cabinets. Cotemporary with Grollier was Guillaume de Choul, who was likewise a man of rank and fortune. He had a good collection of medals, and published many in his Treatise on the Religion of the ancient Romans in 1557. In the low countries we know, from the letters of Erasmus, that the study of medals was begun about the beginning of the 16th century. About the middle of that century, Hubertzus Goltzius, a printer and engraver, travelled over most countries in Europe searching for coins and medals, in order to publish books concerning them. From one of these works it appears, that there were then in the low countries 200 cabinets of medals; 175 in Germany, upwards of 380 in Italy, and 200 in France. It is probable, however, that there are now four times as many in these countries, besides 500 in Britain; but we are not to imagine that all these were grand collections, for of such there are not above a dozen even in Italy: most of those just mentioned were of the class named *caskets* of medals, containing from 100 to 1000 or 2000.

16 Number of coins found in Britain. There are few countries, Italy excepted, in which a greater number of coins have been found than in Britain; though we are by no means well acquainted with the time when the study of them commenced. Mr Pinkerton suspects that Cambden was one of the first, if not the very first, British author who produced medals in his works, and who must have had a small collection. Speed's Chronicle, published in the 17th century, was illustrated with coins from Sir Robert Cotton's cabinet. Gorlæus's collection was purchased by Henry prince of Wales, brother to Charles I. to whom he left it at his death According to Joseph Scaliger, it consisted of 30,000 coins and medals. A collection of 5500 coins was purchased by Archbishop Laud for L.600, and given to the Bodleian library. Thomas earl of Arundel, earl-marshal of England, well known from the Arundelian tables and other antiquities which he imported from Greece and Italy into Britain, had a rich cabinet of medals collected by Daniel Nisum. The dukes of Buckingham and Hamilton, Sir William Paston, Sir Thomas Fanshaw of Ware-Park, Sir Thomas Hanmer, Ralph Sheldon, Esq; Mr Selden, &c. are enumerated by Evelyn as collectors of medals. Charles I. as well as his historian the earl of Clarendon, were also collectors. The king had a very fine cabinet; which, however, were dissipated and lost during the civil commotions. Oliver Cromwell had a small collection; and the cabinet of Charles II. is mentioned by Vaillant in the preface to his treatise intitled *Nummi in Coloniis*," &c. This branch of magnificence has not been much attended to by succeeding British monarchs; though his present majesty has a very good collection of ancient gold coins.

17 British cabinets. A great number of fine cabinets have been formed in Britain since the time of Evelyn. About the year 1720 Haym makes mention of those of the duke of Devonshire, the earls of Pembroke and Winchelsea, Sir

Of what constructed

Sir Hans Sloane, Sir Andrew Fontaine, Mr Sadler, Mr Abdy, Mr Wren, Mr Chichelcy, and Mr Kemp. At present there are many remarkable collections; but that of the late Dr Hunter is deservedly esteemed the most remarkable in Europe, excepting that of the French king. It was not only formed at a great expence, but with much care and ability; many foreign medals offered to it having been rejected. The other remarkable collections are those of the duke of Devonshire, the earl of Pembroke, earl Fitzwilliam, formerly the marquis of Rockingham's, the honourable Horace Walpole, the reverend Mr Crachrode, the reverend Mr Southgate, Mr Townley, Mr R. P. Knight, Mr Edward Knight, Mr Tyson, Mr Barker, Mr Brown, and several others. The museum and universities have also collections; as well as the lawyers library, and the colleges in Scotland.

Sect. IV. *Materials of which Medals are constructed.*

18 Ancient gold coin.

Medals are formed of gold, silver, and the various modifications of copper. The gold usually made use of in coinage is about the fineness of 22 carats; and as the art of purifying this metal was very much unknown in former times, the most ancient medals are for this reason much more impure than the modern coins. Gold is never found in its native state above 22 carats fine; and the very ancient medals are much under that standard. Many of them are composed of a mixture of gold and silver, called by the ancients *electrum*. The gold medals were made of much finer metal after Philip of Macedon became possessed of the gold mines of Philippi in Thrace, and the medals of his son Alexander the Great are equally fine; as well as those of some other princes of that age. Those of the Egyptian Ptolemies are of the fineness of 23 carats three grains, with only one grain of alloy. The Roman coins are very pure even from the earliest times; the art of refining gold being well known before any was coined at Rome. Some authors are of opinion, that the Roman coins begin to fall short of their purity after the time of Titus; but Mr Pinkerton denies that any thing of this kind takes place till the time of the Emperor Severus; and even then only in a very few instances. Most of the Roman gold was brought from Dalmatia and Dacia, where that metal is still to be met with. A very remarkable circumstance is observed in the eastern part of Hungary, which belonged to the ancient Dacia: It germinates in the vines of Tokay, and is found in their stems; as it is elsewhere in the straw of corn.

19 Metal called *electrum*.

Pliny informs us, and indeed it is generally known, that gold and silver are found mixed together in the earth. When the silver amounted to one-fifth part of the gold, the metal was called *electrum*; but sometimes the quantity of silver was added artificially. The gold was in those days as well as at present refined by means of mercury: and the ancient artists had certainly attained to great perfection in this branch of metallurgy; as Bodin tells us, that the goldsmiths of Paris upon melting one of Vespasian's gold coins found only $\frac{1}{788}$ part of alloy.

20 Ancient silver.

Most of the ancient silver, particularly that of Greece, is less pure than that of succeeding times; even the Roman silver is rather inferior to the present standard, and that from the very beginning; but in the time of Severus, the silver appears very bad, and continues so until the time of Dioclesian. Many writers upon this subject have mistaken the *denarii aerei*, "coins of brass washed with silver," for silver currency. Silver coins are extremely scarce from the time of Claudius Gothicus to that of Dioclesian, or from the year 270 to 284; in which short space no fewer than eight emperors reigned. Silver at that time was found mostly in Spain; and the commerce with that country was disturbed by the usurpers who arose in Gaul: and such were the troubles of the times, that not only the silver, but also the gold coins of those eight emperors, are extremely scarce. There is still, however, some silver extant of these eight emperors; and it is certain, that copper washed was never used as silver currency, but was entirely a distinct coinage. Occasional depravations of silver had taken place long before; as Pliny tells us, that Mark Anthony mixed iron with his silver denarii; and Mr Pinkerton informs us, that he had seen a denarius of Anthony, which was attracted by a magnet.

21 Ancient brass.

The ancient brass coins consist of two kinds: the red or Cyprian, which indeed is no other than copper; and the common yellow brass. Our author observes, that in the Roman coinage brass was of double the value of copper, and he is of opinion, that it was the same among the Greeks; and the latter is the metal most commonly made use of in the Greek coinage. The Roman sestertii are always of brass: the middling-sized kind are partly copper and partly brass; the former being double the value of the latter, which are the *ases*.

22 Mixed metals.

Mr Pinkerton next proceeds to give an account of the mixed metals used among the Romans. In Britain all kinds of coins made of mixed metal are without hesitation alleged to be forgeries; although it is certain that the variety of mixed metals used in coinage was very considerable. The most valuable mixture was that of gold or silver already mentioned, named *electrum*; the silver commonly amounting to one-fifth part of the gold made use of, or perhaps more. Of this mixture are many of the early coins of Lydia, and some other Asiatic states; also those of the kings of the Bosporus Cimmerius, during the imperial ages of Rome. Next to the electrum were the coins of Corinthian brass: but Mr Pinkerton informs us, that not a single coin was ever struck of this metal by the ancients; it having been constantly employed only in the fabrication of vases or toys. It was in use at any rate only for a very short time; being altogether unknown in the days of Pliny the Elder. Our author therefore ridicules those who pretend not only to find out imperial coins of this metal, but to discover three kinds of it; *viz*. one in which the gold predominates, another in which the silver prevails, and a third where the brass is most conspicuous. He gives Æneas Vico, one of the most ancient writers on medals, as the author of this idea; but whose opinions were confuted by one Savot, a writer in the 17th century. Vico mentions a coin of this kind struck under Augustus, another of Livia, and a third of Claudius. The mistake, he is of opinion, arose from the circumstance of the first propagator not being able to account for the various

23 Corinthian brass.

Of what conſtructed

various mixtures and modifications of braſs obſervable in ancient coins of the large ſize; and which in ſo common a metal appear very odd to the moderns. Beſides the authority of Pliny and other antiquaries of more modern date, who all declare that they never ſaw a ſingle medal of Corinthian braſs, or of that metal mixed with ſilver and gold, our author adduces another evidence which he looks upon to be ſuperior to either; *viz.* that thoſe who have given into this ſuppoſition, imagine, that the large pieces called *ſeſtertii*, and others called *dupondiarii*, worth about twopence or a penny, are ſaid to have been compoſed of this precious metal. It is unreaſonable to think, that any proportion of gold or ſilver could have been made uſe of in theſe. The coins ſaid to have been ſtruck upon Corinthian braſs are only done upon a modification of common braſs; of which we know, that in proportion to the quantity of zinc made uſe of in conjunction with the copper, the metal aſſumes a variety of hues. On the authority of Pliny he informs us, that the coins miſtaken for Corinthian braſs were no other than prince's metal.

24 Egyptian ſilver coins.

The Egyptian ſilver coins ſtruck under the Roman emperors are at firſt of tolerably pure ſilver; but afterwards degenerate into a mixture of copper and tin with a little ſilver. They are very thick, but many of them are elegantly ſtruck, with uncommon reverſes. There are likewiſe three ſets of braſs coins belonging to this country from the earlieſt times of the Roman emperors there. Some of theſe are of bell-metal or pot-metal; and after the time of Gallienus and Valerian, the coinage of braſs with a ſmall addition of ſilver becomes authoriſed by the ſtate; the coins ſtruck upon it being called *denarii æreι.* Thoſe of lead or copper plated with ſilver have been fabricated by Roman forgers. Some coins of lead, however, have been met with of undoubted antiquity: and an ancient writer informs us, that tin-money was coined by Dionyſius; but none has been found. The lead coins of Tigranes king of Armenia, mentioned as genuine by Jobert, are accounted forgeries by Mr Pinkerton and other modern medalliſts. Plautus, however, makes mention of leaden coins, and ſeveral of them have been found; but our author looks upon them to have been chiefly eſſay pieces, ſtruck in order to let the artiſt judge of the progreſs of the dye. Others are the plated kind already mentioned, fabricated by ancient forgers, but having the plating worn off. A great number of leaden coins are mentioned by Ficorini in a work intitled *Piombi Antichi*, in which he ſuppoſes them to have ſerved as tickets for gueſts; and coins of the ſame kind are alſo mentioned by Paſſeri. In the work intitled *Notitia Imperii Romani*, there is mention of coins made of leather, but none of them have ever been found.

Sect. V. *Of Ancient Money.*

Ancient Money

In conſidering the different ſizes, values, &c. of the Greek and Roman coins, our author treats of the medals as money; a knowledge of which, he ſays, is eſſentially neceſſary to every reader of the claſſics; inſomuch that it may almoſt diſpute the preference with the ſtudies of ancient geography and chronology. Notwithſtanding all that has been written upon the ſubject, however, our author is of opinion, that the ſcience is ſtill in its infancy, in as far as it relates to the real money of the ancients. "The ideal (ſays he), which is indeed the moſt important province of diſcuſſion, has been pretty clearly aſcertained; and we are almoſt as well acquainted with the Attic *mna* or *mina*, and the perplexing progreſs of the Roman *ſeſtertia*, as with our own *pounds*. But with the actual coin of the ancients the caſe is different; and the ignorance even of the learned in this point is wonderful."

25 Knowledge of ancient money imperfect.

Our author now goes on, with great aſperity of language, to particulariſe the ignorant manner in which modern authors have treated the ſubject of medals. "Arbuthnot and Clarke (ſays he) are if poſſible more ignorant of medals than Budæus the very firſt. The latter profeſſes his love of medals, but quotes a conſular coin with the head of Cicero; and looks upon one of the 30 pieces of ſilver, the reward of the treachery of Judas, and which was ſaid to be preſerved among ſome relicts at Paris, to be worthy of reference and commemoration. Arbuthnot, if we may judge from his book, had never ſeen any ancient coins; and Clarke, it is well known, was quite ignorant of them. The latter, with all his labour, ſeems even to have known nothing of the theoretic part of the real ancient money. Indeed Dr Mead's catalogue ſeems to have been almoſt the only *book* on medals which had undergone his peruſal. On the other hand, the ignorance of medalliſts on this ſcore is no leſs profound. To this day they look upon the *didrachms* of Ægina, ſo celebrated in antiquity, as *tridrachms* of Ægium; and upon the early obolus as a braſs coin. In the Roman claſs the large braſs is eſteemed the *as*, while it ſhall be proved that it is the *ſeſtertius*, and worth four *aſes*. The *denarius* is reckoned at ten aſes even in the imperial times; whereas it only went at that rate for the firſt 90 years after the coinage of ſilver at Rome. The denarius æreus is taken for ſilver currency; with other miſtakes which evince that medalliſts are as ignorant of the theory as the others are of the practice."

26 Money firſt coined in the eaſt.

In his account of the ancient Greek money, Mr Pinkerton obſerves, that the light of ſcience, like that of the ſun, has proceeded from eaſt to weſt. "It is moſt probable (ſays he), that the firſt invention of money aroſe like the other arts and ſciences; and ſpread from thence into the weſtern parts of the world. In its firſt ſhape it appeared as mere pieces of metal without any ſtated form or impreſſion; in lieu of which, it was regulated by weight. Even down to the Saxon government in England, large ſums were regulated by weight; and in our own times every ſingle piece is weighed in gold; though with regard to ſilver this nicety is not minded, nor indeed does it ſeem practicable. Among the ancients, whoſe commercial tranſactions were leſs important and extenſive than thoſe of the moderns, ſilver was weighed as well as gold; nay even braſs, in ſome caſes.

27 Its firſt rude ſtate.

28 Greek money.

In Greece, large ſums were determined by *mnæ* or *minæ*; and the moſt capital ſums by *talents*. In every country the mina is ſuppoſed to have contained 100 drachmæ, or ſmall ſilver coins, of that country, and the talent 60 minæ. The mina is ſuppoſed to be a pound weight of the country to which it belonged. The Attic pound, according to Dr Arbuthnot, contained

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tained 16 ounces, equal to our avoirdupois pound: but Mr Pinkerton looks upon this as a very absurd opinion, and accuses the Doctor of having adopted it merely that he may explain a passage in Livy. He is of opinion, that the Attic pound is very nearly the same with the pound Troy. The mina of Athens had at first 73 drachms; but by Solon it was fixed at 100. The ancient drachm weighed the same which it does at present in medical weight, *viz.* the eighth part of an ounce. The mina or pound of 12 ounces had consequently 96 of these drachms; but four of them were given to the round sum to supply defects in the alloy; "and indeed (says our author), in consequence of a common practice in all ages and in all countries, of giving some addition to a large weight. Thus the pound in weight had but 96 drachmæ in fact, while the pound in tale had 100; as the Roman libra in weight had but 84 denarii; in tale 100; and as our pound in tale, by an inverse progress, is not a third of our pound in common weight."

29 Of the ancient talents.

Notwithstanding the very severe criticism on Dr Arbuthnot just mentioned, however, we find our author adopting his account of the *talents* used in coinage in several countries. Thus, according to the Doctor,

The Syrian talent had	15 Attic minæ.
Ptolemaic -	20
Antiochian -	60
Eubœan - -	60
Babylonian -	70
Larger Attic -	80
Tyrian -	80
Egyptian -	80
Eginean -	100
Rhodian -	100

Notwithstanding the concession made here by Mr Pinkerton to the Doctor, he tells us, that he very much questions this list of talents, and that many ancient writers are little to be relied upon. "Writers on this subject confess, that the numbers in all ancient manuscripts are the parts most subject to error, as being almost always contracted. They ought to allow that the authors themselves must often be liable to wrong information.

"Herodotus mentions, that King Darius ordered gold to be paid into his treasury by the Euboic talent, and silver by the Babylonian. The Euboic is esteemed the same with that called afterwards the Attic; and as we estimate gold by carats, so it is natural to suppose, that the most precious metal would be regulated by the most minute weight. But I confess, I take the Babylonic talent to be the same with that of Ægina. Mr Raper has proved the first coins of Macedon to be upon the standard of Ægina. Now the early Persian coins are upon that very scale, the largest tetradrachms weighing from 430 to 440 grains. Hence it follows, that the Persian silver coins were of the Æginian standard; and the payment was certainly to be made according to the standard of the money. The larger Attic talent was of 80 lesser minæ; because the larger Attic mina was of 16 ounces. The Alexandrian talent, according to Festus, consisted of 12,000 denarii, being the same with that used by the Egyptian kings in their coins; and is shown by Mr Raper to have been the same with the talent of Ægina. Perhaps the whole of the ancient coins of Asia, Africa, Greece, Magna Grecia, and Sicily, are reducible to three talents or standards. 1. That of Ægina, used in most of the more ancient silver coinages; as would seem in even the later of Egypt, Carthage, Cyrene, &c. 2. The Attic (being the Asiatic gold standard, afterwards used by Phidon king of Argos in estimating gold, and called Euboic from Eubœa, one of the quarters of the city of Argos), used in Athens and the greater part of the world as the standard both of gold and silver. 3. The Doric or Sicilian talent of 24 nummi, each worth an obolus and an half; whence the talent is estimated at six Attic drachms or three darics. These weights continued to be the standard of money after it began to be distinguished by impression; nay, to the fall of Greece and prevalence of the Roman empire."

30 Coinage originates in Lydia.

Coinage, according to Herodotus, was first invented by the Lydians, from whom the Greeks quickly received it. The former could not have received it from the Persians, whose empire did not begin till 570 B.C. though our author supposes that it might have proceeded from the Syrians, who carried on commerce in very ancient times. The most ancient Greek coins of silver have an indented mark upon one side, and a tortoise upon the other; and those of greatest antiquity have no letters upon them. Those of later date have ΑΙΓΙ marked upon them, which medallists interpret of Ægium in Achaia; being led into that supposition by the tortoise, which they look upon as the sure mark of the Peloponnesus. But though our author agrees that the tortoise was so, he thinks that they are otherwise very far wrong in their conclusions. Ægium in Achaia was a place of no consequence till the times of Aratus and the Achaian league; but there are 11 of these coins in Dr Hunter's cabinet, which show that they must have been struck in times of the most remote antiquity, and that the place where they were struck was rich and flourishing at the time. The coins we speak of are not uncommon; but those which have the name ΑΙΓΕΙΩΝ at full length, and which may perhaps belong to Ægium in Achaia, are extremely scarce; insomuch that in all Dr Hunter's vast collection there are not above one or two. They are likewise constructed upon a scale quite different from all other Grecian money; being of 8, 13, 15½, 90, and about 186 grains. The Grecian drachma at an average is 66 grains; and Mr Pinkerton thinks it would have been strange if pieces had been struck of eight-tenths of an obolus, of an obolus and an half, or of a drachma and an half. Ægium being originally an obscure village, could not be the first which coined money; so that Mr Pinkerton supposes the name ΑΙΓΙ to have stood for Ægialus, the ancient name of Sicyon, a wealthy and powerful city; or rather Ægina, the mint of which was much celebrated, and perhaps the most ancient in Greece.

31 Most ancient Greek coins described.

Other arguments in favour of these coins being derived from Ægina, are drawn from their weight as well as their workmanship, which are quite different from those bearing the name of Ægium at full length. The coinage of Ægina is known to have been different from that of the rest of Greece; insomuch that its drachma was worth 10 Attic oboli, while the Attic drachma was valued only at six. Hence the drach-

mas

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mas of Ægina were named by the Greeks παχειας, or *thick*; a name very applicable to the coins in queſtion. From theſe obſervations, our author is of opinion, that we may even diſtinguiſh the preciſe weight of the ancient coins of Ægina. According to the exact proportion, the drachma of this place ſhould weigh exactly 110 grains; and one of them very much rubbed weighed above 90. The others of larger ſize, which ſeem to be didrachms of Ægina, weigh from 181 to 194 grains; but the latter being the only one he could meet with in good preſervation, it was impoſſible to form any juſt medium. Even in thoſe beſt preſerved, he thinks that ten grains may be allowed for a waſte of the metal in ſo long a time as 2400 years, which would bring the drachma of Ægina near its proper ſtandard. The obolus of Ægina was in proportion to its drachma of ſix oboli. It is the piece of 15½ grains, and 13 when very much rubbed. The hemiobolon is that of eight, and when rubbed ought to weigh nine.

32 The drachma the moſt general denomination.

The general denomination of the Greek money is the drachma, or eighth part of an ounce; which to this day is retained in the medical weights, the Grecian coins receiving their names from the weights they bore; though in ſome inſtances the weights received their appellations from the coins. The ſilver drachma, according to Mr Pinkerton, was about nine pence ſterling; and he finds fault with thoſe who make the drachma and denarius both equal to one another, the latter being no more than eight pence. The didrachm of ſilver, according to the ſame calculation, was worth 18d.; but the *tridrachm* occurs very rarely: and Mr Pinkerton is even of opinion, that medalliſts give this name to the didrachm of Ægina. The largeſt of all the Grecian coins is the tetradrachm, which on the Æginean ſtandard is worth five ſhillings; but in thoſe of the other ſtates only four. There are, however, many ſubdiviſions in the ſilver drachma; the higheſt being the tetraobolion or coin of four oboli; being in proportion to the drachma as our groat to a ſixpence, weighing about 44 grains, and being in value about ſixpence. The hemidrachm or triobolion comes next in value, weighing about 33 grains, and worth fourpence halfpenny. The ſilver diobolion, or third of the drachma, weighs about 22 grains, and is worth three pence. The obolus of ſilver weighs about 11 grains, and is worth only three halfpence. There is likewiſe a hemiobolion in ſilver, or half the obolus, of five grains and an half, value three farthings: and another called *tetartobolion dichalcos* or quarter obolus, which is the moſt minute coin yet met with; and by reaſon of its extreme ſmallneſs, weighing only two grains and a quarter, is now very ſcarce: but there is one in the cabinet of Dr Hunter, and ſome more have been lately brought from Athens by Mr Stuart. Some of them are likewiſe met with at Tarentum. It would appear, however, that there were ſome ſtill ſmaller, and of value only three-fourths of a farthing. None of theſe have been met with; and the ſmallneſs of the ſize renders it improbable that any will ever be met with; as the peaſants, who commonly diſcover coins, would probably either not obſerve them at all, or if they did would neglect them as things of no value.

33 Different names of Greek coins

Many different names have been impoſed on the coins belonging to the different ſtates of Greece: thus Κορη, *the maiden*, was a name often applied to the tetradrachm, and which would ſeem to apply to thoſe of Athens; though there are coins of other cities with the head of Proſerpine, and the word Κορη, to which it would appear more applicable in our author's opinion. Χελωνη, *the ſhell*, was the name of another coin from its type. A Sicilian coin was named Δημαρετιον, from Gelon's wife. A tetradrachm was named Κραπαταγους, and had eight ευβοεας or hemidrachms. The τροιζηνιον, ſo called from its country Troizene, had Pallas on one ſide and a trident on the reverſe. The hemiobolion was the πελανορ of Lacedemon; and the Κολλυβος is ſuppoſed to have been equal to the Roman ſeſtertius or quarter drachma. The *cyſtophori* were coins with the myſtic cheſt or hamper of Bacchus upon them, out of which a ſerpent riſes; and are much celebrated in antiquity. We are told by Livy, that Marcus Acilius, in his triumph over Antiochus and the Etolians, carried 248,000 of them; Cneius Manlius Vulſo in that over Gallo-Græcia had 250,000; and Lucius Emilius Regillus, in his naval triumph over the fleets of Antiochus, had 131,300. Cicero likewiſe mentions his being poſſeſſed of a vaſt ſum in them. The moſt probable opinion concerning them ſeems to be, that they are all ſilver tetradrachms; ſuch as belong to the cities of Apamea and Laodicea in Phrygia; Pergamus in Myſia; Sardes and Tralles in Lydia; and Epheſus; but it is a miſtake to aſcribe any to Crete. Mr Pinkerton thinks it abſurd to imagine that Crete, a ſmall iſland, ſhould ſtrike ſuch vaſt numbers of coins; though Cicero mentions his being in poſſeſſion of an immenſe treaſure in them at the time he was governor of Aſia Minor. "It is moſt likely (ſays Mr Pinkerton), that his wealth ſhould be in the coin of the country to which he belonged. But what had theſe triumphs or Cicero's government to do with Cretan money? But indeed the coins themſelves, as above noticed, eſtabliſh the fact."

34 Coins of Cyzicus.

Another ſet of coins famous in antiquity were thoſe of Cyzicus in Myſia, which were of gold; but they are now almoſt entirely vaniſhed by being recoined in other forms. The Αρυανδικον νομισμα, or *money of Aryandes*, who was made governor of Egypt by Cambyſes, is made mention of by Heſychius; but none of them, as far as is known, have reached our times. They muſt have been marked with Perſian characters, if with any. The coin of Queen *Philiſtis* is mentioned by the ſame writer, and many of theſe pieces are ſtill extant; but we know not where this queen reigned, nor does there ſeem to be any method of finding it out. Mr Pinkerton inclines to believe, that ſhe preſided over Sicily; and as a confirmation of that ſuppoſition, mentions ſome inſcriptions of ΒΑΣΙΛΙΣΣΑΣ ΦΙΛΙΣΤΙΔΟΣ on the *Gradini* of the theatre at Syracuſe; but which appear not older than the Roman times. Some authors are of opinion, that ſhe reigned in Coſſara or Malta; which our author thinks much more improbable.

35 Athenian coins.

The moſt particular attention with regard to the names and ſtandard of coins is due to thoſe of Athens; and it is remarkable, that moſt of them which have reached us are of a very late period, with the names of magiſtrates

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magiſtrates inſcribed upon them. Some of theſe bear the name of Mithridates; and few are older than the era of that prince; who, it is well known, took the city of Athens in his war with the Romans. I ſuſpect (ſays Mr Pinkerton) that no Athenian coins of ſilver are poſterior to Sylla's infamous deſtruction of that city: an event the more remarkable, as Salluſt tells us, that Sylla was learned in Greek. Indeed Caligula, Nero, and moſt of the peſts of ſociety, have been learned men, in ſpite of a noted axiom of Ovid,

Sed ingenuas didiciſſe feliciter artes
Emollit mores, nec ſinit eſſe feros.

It is ſtill more remarkable, that the fabric of Athenian coins is almoſt univerſally very rude: a ſingular circumſtance, if we reflect how much the arts flouriſhed there. It can only be accounted for from the excellence of their artiſts being ſuch as to occaſion all the good ones to be called into other countries, and none but the bad left at home. In like manner, the coins ſtruck at Rome in the imperial times are excellent, as being done by the beſt Greek artiſts; while thoſe of Greece, though famous at that time for producing miraculous artiſts, are during that period commonly of very mean execution. The opulence of Athens in her days of glory was very great; owing in an eminent degree to her rich commerce with the kingdoms on the Euxine ſea; carried on chiefly from Delos, which belonged to Athens, and was the grand centre of that trade." Hence it has become matter of ſurpriſe to Neumann, that when there are ſo many coins of Mycene, an iſland even proverbially poor, there ſhould be none of Delos. But Mr Pinkerton accounts for this from Mycene's being a free ſtate, and Delos ſubject to Athens. "It may be well ſuppoſed (ſays he, that Athens had a mint at Delos; and ſuch Athenian coins as have ſymbols of Apollo, Diana, or Latona, were ſtruck in this iſland."

36 Greek copper money.

The copper-money of the Greeks is next in antiquity to the ſilver. Mr Pinkerton is of opinion, that it was not uſed at Athens till the 26th year of the Peloponneſian war; about 404 years before Chriſt, and 300 after ſilver was firſt coined there. The firſt copper coins were thoſe of Gelo of Syracuſe, about 490 B. C.

37 Of the chalcos.

The chalcos of braſs, of which eight went to the ſilver obolus, ſeems to have been the firſt kind of Greek coin. At firſt it was looked upon as of ſo little conſequence, that it became proverbial; and to ſay that a thing was not worth a *chalcos*, was equivalent to ſaying that it was worth nothing. As the Greeks became poor, however, even this diminutive coin was ſubdivided into two, four, nay eight λεπτα or ſmall coins; but our author cenſures very ſeverely thoſe who have given an account of thoſe diviſions. "Pollux and Suidas, copying from him (ſays he), tell us, that there were ſeven lepta to one chalcos; a number the moſt unlikely that can be, from its indiviſibility and incapacity of proportion.

"Pollux lived in the time of Commodus, ſo was too late to be of the ſmalleſt authority: Suidas is four or five centuries later, and out of the queſtion. Pliny tells us, that there were ten chalci to the obolus; Diodorus and Cleopatra that there were ſix; Iſidorus ſays there were four: and if ſuch writers differ about the larger denomination, we may well imagine that the ſmaller equally varied in different ſtates; an idea ſupported by theſe undeniable witneſſes the coins which remain. Moſt of the Greek copper-coin which has reached our times conſiſts of chalci; the lepta being ſo ſmall as to be much more liable to be loſt." In Dr Hunter's cabinet, however, there are ſeveral of the dilepta of Athens: and from being ſtamped with the repreſentation of two owls, ſeem to be the ſame with the ſilver diobolus: "a circumſtance (ſays Mr Pinkerton) of itſelf ſufficient to confute Pollux; for a dilepton can form no part of ſeven; a number indeed which never appeared in any coinage of the ſame metals, and is contradictory to common ſenſe. It may be obſerved, that the whole braſs coins of Athens publiſhed by Dr Combe are reducible to four ſizes, which may be the *lepton*, *dilepton*, *tetralepton* or *hemichalcos*, and *chalcos*. The firſt is not above the ſize of one of king James I.'s farthing tokens; the laſt about that of our common farthing." The *lepta* was alſo called Κερμα, as being change for the poor. The Κιδαβος, perhaps ſo called from the figure of a wolf upon it, was the coin of a particular ſtate, and if of braſs muſt have weighed three chalci. The other names of the copper-coins of Greece are but little known. Lycurgus ordered iron money to be coined at Sparta; but ſo periſhable is this metal, that none of that kind of money has reached our times.

38 Lepton, dilepton, &c.

After the conqueſt of Greece by the Romans, moſt of the coins of that country diminiſhed very much in their value, the gold coinage being totally diſcontinued: though ſome of the barbarous kings who uſed the Greek character were permitted to coin gold, but they uſed the Roman model; and the ſtandard uſed by the few cities in Aſia who ſpoke the Greek language in the times of the emperors is entirely unknown. Copper ſeems to have been the only metal coined at that time by the Greeks themſelves; and that upon the Roman ſtandard, then univerſal through the empire, that there might be no impediment to the circulation of currency. They retained, however, ſome of their own terms, uſing them along with thoſe of the Romans. The *aſſarion* or *aſſarium* of Rome, the name of the diminiſhed *as*, being 16 to the drachma or denarius, the obolus was ſo much diminiſhed in value as to be ſtruck in braſs not much larger than the old chalcus, and valued at between two and three aſſaria; which was indeed its ancient rate as to the drachma. This appears from the copper coins of Chios, which have their names marked upon them. The braſs obolus, at firſt equal in ſize to the Roman ſeſtertius or large braſs, leſſens by degrees to about the ſize of a ſilver drachma. From the badneſs of the imperial coinage in Greece alſo, it appears that braſs was very ſcarce in that country, as well as in all the cities uſing the Greek characters; being found moſtly in the weſtern countries of the Roman empire. The time of this declenſion in ſize of the Greek coins is by Mr Pinkerton ſuppoſed to have been from Auguſtus down to Gallienus. He is of opinion, however, that the copper obolus, at firſt above the ſize of large braſs, was uſed in Greece about the time of its firſt ſubjection to Rome; and that the lepta ceaſing, the chalci came in their room, with the dichalcus and the hemiobolion of braſs.

39 Era of the declenſion of the Greek coinage.

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40 Gold coins of Greece.

With reſpect to the gold coins of the Greeks, Mr Pinkerton is of opinion that none of that metal was coined before the time of Philip of Macedon, as none have reached our times prior to the reign of that monarch. From a paſſage in Thucydides our author concludes, that in the beginning of the Peloponneſian war the Athenians had no gold coin. Mentioning the treaſure in the Acripolis or citadel of Athens, at the commencement of that war, the hiſtorian mentions ſilver coin, and gold and ſilver in bullion; and had any of the gold been in coin, he would certainly have mentioned it. Philip began his reign about 68 years after the beginning of the Peloponneſian war; and we can ſcarce ſuppoſe that any city would have preceded the elegant and wealthy Athens in the coining of gold.

41 Gold coined early in Sicily.

Notwithſtanding, however, this deficiency of gold coin among the Greeks, it is certain that the coinage of gold had taken place in Sicily long before; as we have gold coins of Gelo about 491 B. C. of Hiero I. 478, and of Dionyſius I. in 404, all uſing the Greek characters; though not to be ranked among the gold coins of Greece, as Philip cauſed his to be. Gold coins of Syracuſe even appear of the third claſs of antiquity, or with an indented ſquare, and a ſmall figure in one of its ſegments. Gold coins were uſed in the cities of Brettium, Tarentum, and throughout Magna Grecia; alſo in Panticapæa in Thrace, and likewiſe Coſa in that country; but not in Tuſcany, as is commonly believed, though Neumann proves that they are ſtruck by Brutus, and are unqueſtionably as ancient as the Greek coins. The Thebans and Athenians probably coined the firſt gold after Philip had ſet them the example, and when they were attempting to reſiſt the projects of that enterpriſing monarch. The Ætolians probably coined their gold during the time of their greateſt power, about a century after Philip, and when they were combating the power of Aratus and the Achæan league. "There is (ſays Mr Pinkerton) but one ἡμιχρυσος of Thebes, much worn, in Dr Hunter's cabinet, and weighing but 59 grains; and perhaps not above two or three χρυσοι or gold didrachms of Athens in the world; one of which is alſo in the collection of Dr Hunter, and weighs 132½ grains. It appears to be more modern than the reign of Philip. That monarch having got poſſeſſion of the mines of Philippi in Thrace, improved them ſo much, that they produced him annually above a thouſand talents of gold, or 2,880,000 l. of our money. From this gold the firſt coins named from the monarch *Philippi* were ſtruck. They were marked with his portrait; and for many ages after were ſo numerous, that they were common in the Roman empire; whence the name *Philippi* became at length common to gold, ſilver, and at laſt even braſs coins of their ſize. Even in the time of Philip gold was very ſcarce in Greece; but after the Phocians had plundered the temple of Delphos, this precious metal, which had been valued as gems, and conſecrated only to the decoration of the temples of the gods, began to be known among the Greeks. The comparative value of gold and ſilver, however, ſeem to have been at that time very different from what they are now. Herodotus values gold at 13 times its weight in ſilver; Plato in his Hipparchus at 12; and even the low value of 10 to 1 ſeems to have been the ſtated value in Greece, tho' in Rome the plenty of ſilver from the Spaniſh mines made the value of gold to be much higher; and there is no reaſon to think that it was ever valued in that city at leſs than 12 times its weight in ſilver. The *Philippus*, χρυσος, gold piece, or *ſtater*, is a didrachm, and is the moſt common of all the ancient coins. Mr Pinkerton is of opinion that it went for 20 ſilver drachms on its firſt appearance; but in latter times for 25 Greek drachmæ or Roman denarii. There are proofs of the Philippi being didrachms, both from the writings of ancient authors and from numbers of the coins themſelves, which remain to this day; and that the χρυσος, or principal gold coin of Greece, was of the ſame weight, is alſo evident from ancient writings. It was anciently worth about 15s. but valuing gold now at the medium price of 4 l. per ounce, it is worth about 20 s. The ἡμιχρυσος, or half the former coin, ſcarcely occurs of the coinage of Philip and Alexander, though it does of Hiero I. of Syracuſe and of king Pyrrhus. It paſſed for ten ſilver drachmas, and was valued only at 7s. 6d. though now worth 10s. There was another diviſion of this kind worth about 5s. There were beſides ſome leſſer diviſions of gold coins, which could not be worth above two drachmas. Theſe were coined in Cyrene; and there were beſides ſeveral old gold coins of Aſia Minor, the value of which is now unknown. Our author ſuppoſes that they were coined not with relation to their weight as parts of the drachma, but merely to make them correſpond with ſo many ſilver pieces as was neceſſary. There are alſo larger coins than the χρυσος, the διχρυσος of Alexander and Lyſimachus being double its value. Some others are met with by Lyſimachus, Antiochus III. and ſome of the Egyptian monarchs, weighing four times the χρυσος, and now worth about 4l. ſterling. Some weigh even more; but this our author ſuppoſes owing to the gold being leſs pure.

42 Roman money.

In Rome, as well as in Greece, the money was at firſt eſtimated by weight; and the firſt metal coined by that people was copper, ſilver being long unknown in Rome; nor is it certainly known that any ſilver has ever been found in the Italian mines. In Rome the firſt valuation of money was by the *libra gravis æris*, or pound of heavy braſs: and in the progreſs of their conqueſts, the little ſilver and gold that came in their way was regulated by the ſame ſtandard, as appears from the ſtory of Brennus.

43 Of the Roman pound.

The weights made uſe of were the ſame with thoſe which continue to this day. The pound conſiſted of 12 ounces of 458 grains each; but the pound by which the money was weighed appears to have conſiſted only of 420 grains to the ounce, or to have contained in all 5040 grains. This became the ſtandard of copper; and when ſilver came to be coined, ſeven denarii went to the ounce as eight drachms did in Greece. Gold was regulated by the *ſcriptulum* or *ſcrupulum*, the third part of a denarius, and by the larger weights juſt mentioned. The number 10 was at firſt uſed by the Romans in counting their money; but finding afterwards that a ſmaller number was more convenient, they divided it into quarters; and as the quarter of 10 is 2½, they for this

44 Seſtertius, as, &c.

reaſon beſtowed upon it the name of *ſeſtertius* or "half the third;" to expreſs that it was two of any weights, meaſures, &c. and half a third; whence the ſeſtertius came

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came at laſt to be the grand eſtimate of Roman money. The *as* being at firſt the largeſt, and indeed the only Roman coin, the word *ſeſtertius* means *ſeſtertius as*, or "two aſes and an half." On the firſt coining of ſilver, the denarius of ten aſes was ſtruck in the moſt common and convenient denary diviſion of money, or that by tens; the ſeſtertius being of courſe two aſes and an half. But the denarius being afterwards eſtimated at 16 aſes, the name ſeſtertius wâs ſtill applied to a quarter of the denarius, though it now contained four aſes. The term *ſeſtertius* was applied to all ſums not exceeding 1000 ſeſtertii, or L. 8 : 6 : 8; but for greater ſums the mode of the ſeſtertius was likewiſe altered, though not to exclude the former. Very large ſums of money were eſtimated by the hundred weight of braſs; for the Romans were at firſt unacquainted with the talent. The hundred weight, by way of eminence, was diſtinguiſhed by the name of *pondus*, and *ſeſtertium pondus* became a phraſe for two hundred weight and an half. Mr Pinkerton is of opinion, that we may value the *as libralis* of ancient Rome at about eight-pence Engliſh. Eſtimating the *as* therefore at a pound weight, the *ſeſtertium pondus* was equal to 1000 *ſeſtertii*, or L. 8 : 6 : 8; and by a coincidence which our author ſuppoſes to have been the effect of deſign, as ſoon as the ſilver coinage appeared, the *ſeſtertium centum denariorum* was always equal to L. 8, 6s. 8d. alſo. The word *ſeſtertium* itſelf, however, ſeems to have been unknown prior to the coinage of ſilver money at Rome: the *pondera gravis æris* being ſufficient before that time for all the purpoſes of a ſtate in which money was ſo ſcarce. But however this may be, the *pondus* or hundred weight of braſs was preciſely worth 100 denarii, or a pound of ſilver. As the great ſeſtertium was always valued at 1000 of the ſmaller, or L. 8 : 6 : 8, we never find one ſeſtertium mentioned in authors, but two, three, or more; ten thouſand of them being equal to L. 8,333,333 : 6 : 8.

45 Whence the Romans derived their coinage.

The ſtates from which the Romans may be ſuppoſed firſt to have derived their coinage, were the Etruſcans and the Greek colonies in Magna Grecia and Sicily. Joſeph Scaliger, Gronovius, &c. contend that it was from the Sicilians that the Romans firſt derived their knowledge of money; but Mr Pinkerton argues that it was from the Etruſcans. In confirmation of his opinion he appeals to the ſtate of the Roman territories in the time of Servius Tullius, who is looked upon to have been the firſt who coined money at Rome. At that time the whole Roman dominion did not extend beyond ten miles round the city; and was entirely ſurrounded by the Etruſcan and Latin ſtates; Cuma being the next Greek colony to it that was of any conſequence, and which was in the neighbourhood of Naples, at about the diſtance of 150 miles. Our author aſks, Is it reaſonable to think that the Romans received the uſe of money from the Etruſcans and Latians who were their neighbours, or from the Greeks, who were at a diſtance, and at that time, as far as appears from their hiſtory, abſolutely unknown to them? "If this argument (adds he) is ſtrong with regard to the neareſt Grecian colonies, what muſt it be with reſpect to Sicily, an iſland 300 miles diſtant from Rome, where it was not known, at that time, if a boat went by land or water?" Arguments, however, for this opinion, have been derived from the ſimilarity betwixt the Sicilian and Roman coins; which Mr Pinkerton now proceeds to examine. The Greek pound in Sicily was called λιτρα, and conſiſted, like the Roman, of 12 ουγκιαι, or ounces; and Mr Pinkerton grants that the Roman *libra* was derived from the Greek λιτρα, but denies that the *as*, or libra, a coin, was from Sicilian model. The Sicilians had indeed a coin named λιτρα; but it was of ſilver, and of equal value to the Eginean ſtandard, ten of which went to the Sicilian δεκαλιτρον. He differs from Gronovius, that the ſtandard of Ægina was uſed at Corinth, and of courſe at Syracuſe; as it appears from Ariſtotle, that the Sicilians had a talent or ſtandard of their own. The Sicilian obolus or λιτρα contained alſo 12 ounces or *chalci*, ſo named at firſt becauſe they weighed an ounce weight; but the ουγκιαι of Hiero weigh more than a troy ounce; and the braſs coins of Agrigentum are marked with cyphers as far as ſix: the largeſt weighing only 186 grains, or about one third of the primitive ounce. Our author denies that even the Roman denarius took its riſe from the Sicilian δεκαλιτρον, as many authors aſſert. Were this the caſe, it would have weighed 180 grains; whereas the Roman denarii are not above the third part of the quantity.

46 Origin of the Sicilian coins.

From all theſe conſiderations, our author is of opinion that the Sicilians borrowed the diviſion of their λιτρα from the Etruſcans, or poſſibly from the Romans themſelves; which our author thinks is more probable than that the Romans had it from Sicily. The ſtrongeſt argument, however, againſt the Roman coinage being borrowed from the Sicilian is, that though great numbers of Sicilian coins are to be found in the cabinets of medalliſts, yet none of them reſemble the *as libralis* of the Romans in any degree. In moſt cabinets alſo there are Etruſcan coins upon the exact ſcale of the *as libralis*, and ſeveral of its diviſions; from whence Mr Pinkerton concludes, that "theſe, and theſe alone, muſt have afforded a pattern to the primitive Roman coinage." The Etruſcans were a colony from Lydia, to which country Herodotus aſcribes the firſt invention of coinage. "Thoſe coloniſts (ſays Mr Pinkerton), upon looking round their ſettlements, and finding that *no* ſilver was to be had, and *much leſs* gold," ſupplied the mercantile medium with copper; to which the caſe of Sweden is very ſimilar, which, as late as the laſt century, had copper coins of ſuch magnitude, that wheel-barrows were uſed to carry off a ſum not very conſiderable.

47 Of the moſt ancient Roman coins.

Some coins are found which exceed the *as libralis* in weight; and theſe are ſuppoſed to be prior to the time of Servius Tullius. Some of them are met with of 34 and of 53 Roman ounces; having upon one ſide the figure of a bull rudely impreſſed, and upon the other the bones of a fiſh. They are moſt commonly found at Tudder, or Tudertum in Umbria; but they appear always broken at one end: ſo that Mr Pinkerton is of opinion that perhaps ſome might be ſtruck of the decuſſis form, or weighing ten pounds. Theſe pieces, in our author's opinion, make it evident, that the Romans derived their large braſs coins from the Etruſcans and the neighbouring ſtates: they are all caſt in moulds; and the greater part of them appear much more ancient than the Roman aſes, even ſuch as are of the greateſt antiquity.

Mr

Mr Pinkerton agrees with Sir Iſaac Newton as to the time that Servius Tullius reigned in Rome, which he ſuppoſes to be about 460 B. C. His coinage ſeems to have been confined to the as, or piece of braſs having the impreſſion of Janus on the one ſide and the prow of a ſhip on the other, becauſe Janus arrived in Italy by ſea. Varro, however, informs us, that the very firſt coins of Tullius had the figure of a bull, or other cattle upon them, like the Etruſcan coins, of which they were imitations. Thoſe with the figure of Janus and the prow of a ſhip upon them may be ſuppoſed firſt to have appeared about 400 B. C. but, in a ſhort time, various ſubdiviſions of the as were coined. The

48 Subdiviſions of the as.

ſemis or half is commonly ſtamped with the head of Jupiter laureated; the *triens* or third, having four cyphers, as being originally of four ounces weight, has the head of Minerva; the *quadrans* or quarter, marked with three cyphers, has the head of Hercules wrapt in the lion's ſkin; the *ſextans* or ſixth, having only two cyphers, is marked with the head of Mercury with a cap and wings; while the *uncia* having only one cypher, is marked with the head of Rome. All theſe coins appear to have been caſt in moulds, by a conſiderable number at a time; and in the Britiſh muſeum there are four of them all united together as taken out of the mould in which perhaps dozens were caſt together. In proceſs of time, however, the ſmaller diviſions were ſtruck inſtead of being caſt; but the larger ſtill continued to be caſt until the as fell to two ounces. Even after this time it was ſtill called *libra*, and accounted a pound of copper;

49 Larger denominations of it ſtruck.

though there were now larger denominations of it coined, ſuch as the *biſſas* or double as: *treſſis* and *quadruſſis* of three and four aſes; nay as far as *decuſſis* or ten aſes, marked X. Olivieri mentions one in his own cabinet weighing upwards of 25 ounces, and caſt when the as was about three ounces weight. There is likewiſe in the Muſæum Etruſcum a decuſſis of 40 Roman ounces, caſt when the as was at four ounces. There was likewiſe a curious decuſſis in the Jeſuit's library at Rome, for which an Engliſh medalliſt offered 20l.; but it was ſeized by the Pope along with every other thing belonging to the ſociety.

50 Decreaſe of the as in weight.

Mr Pinkerton conteſts the opinion of Pliny that the as continued of a pound weight till the end of the firſt Punic war. His opinion (he ſays) is confuted by the coins which ſtill remain; and it appears probable to him that the as decreaſed gradually in weight; and, from one or two of the pieces which ſtill exiſt, he ſeems to think that the decreaſe was ſlow, as from a pound to eleven ounces, then to ten, nine, &c.; but neither the as nor its parts were ever correctly fixed. During the time of the ſecond Punic war, when the Romans were ſore preſſed by Hannibal, the as was reduced to a ſingle ounce. It is ſaid to have taken place in the 215th year before our era, being about 36 years after the former change. This as libralis, with the face of Janus upon it, is the form moſt commonly met with previous to its being reduced to two ounces. Our author ſuppoſes that the as libralis continued for at leaſt a century and an half after the coinage of Tullus, down to 300 B. C. about the year of Rome 452, between which and the 502d year of Rome a gradual diminution of the as to two ounces muſt have taken place. The following table of the dates of the Roman coinage is given by Mr Pinkerton.

The libralis, coined by Tullus with the figures of oxen, &c. about 167 years after the building of Rome, according to Sir Iſaac Newton, or about the year before Chriſt 460

As libralis with Janus and the prow of a ſhip	400
As of ten ounces - -	300
Eight - - - -	290
Six - - - - -	280
Four - - - -	270
Three - - - -	260
Two, according to Pliny - -	250
One, according to the ſame author -	214

About 175 B. C. alſo, we are informed by Pliny, that the as was reduced to half an ounce by the Papyrian law, at which it continued till the time of Pliny himſelf, and long after.

After the Romans began to have an intercourſe with Greece, a variety of elegant figures appear upon the parts of the as, though not on the as itſelf till after the time of Sylla. Towards the latter end of the republic alſo, *dupondii*, or double aſes, were coined, together with the ſeſtertii æris, which came in place of the *quadruſſes*, when the denarius began to be reckoned at 16 aſes; probably at the time the latter was reduced to half an ounce. In ſome inſtances it is to be obſerved, that the Romans accommodated their coins to the country where 51.

Coins on the Greek ſcale marked as Roman.

their army was ſtationed; whence we have many coins marked as Roman, which have been coined in Magna Grecia and Sicily, and are evidently upon the Greek and not the Roman ſcale. In the latter part of the republican times, alſo, the types begin to vary; ſo that we have a braſs coin ſuppoſed to be ſtruck by Sextus Pompeius in Sicily, having upon it a double head of that warrior, repreſenting a Janus. Mr Pinkerton ſuppoſes it to have been a dupondius; which indeed appears to be the caſe from the double head. This coin is of copper, and ſtill weighs an ounce, notwithſtanding its antiquity.

The largeſt imperial copper coin was the ſeſtertius, 52

Of the ſeſtertius.

a piece worth about two-pence of our money. Mr Pinkerton cenſures ſeverely the opinion of other medalliſts, all of whom ſay that the ſeſtertius was of ſilver. "In fact (ſays he), it would be as rational in any antiquary, a thouſand years hence, to contend that the halfpenny and farthing are of ſilver, becauſe they were ſo in the reign of Henry VIII." In confirmation of his own opinion, he quotes the following paſſage from Pliny: "The greateſt glory of braſs is now due to the Marian, called alſo that of Cordova. This, after the Livian, moſt abſorbs the lapis calaminaris, and imitates the goodneſs of native orichalcum in our ſeſtertii and dupondiarii, the aſes being contented with their own copper." Gronovius confeſſes that he does not know what to make of this paſſage, and that it cauſes him heſitate in his opinion. The *Livian* mine mentioned here by Pliny, is ſuppoſed to have got its name from *Livia* the wife of Auguſtus; and it is probable that the pieces marked with her portrait, intitled JUSTITIA, SALUS, VIRTUS, &c. were dupondii from this very mine, the metal being exceedingly fine, and of the kind named *Corinthian braſs* by the ancient medalliſts. "Perhaps (ſays Mr. Pinkerton) the mine received its name from this very

6 cir-

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circumstance of her coins being struck in the metal taken from it."

53 Coinage of yellow brass.

No change took place in the Roman coinage from the time that the as fell to half an ounce to the days of Pliny: but Mr Pinkerton observes, that before the time of Julius Cefar yellow brass began to be used, and was always looked upon to be double the value of Cyprian or red copper. There are but few coins in large brass immediately before Julius Cæsar, or even belonging to that emperor; but from the time of Augustus downward, the large coins are all found of brass, and not one of them copper. The largest of what are called the middle size are all of yellow brass; and the next size, which is the as, and weighs half an ounce, is universally copper. What the ancients named *orichalcum*, or what we call *brass*, was always looked upon to be greatly superior in value to the æs cyprium. Procopius, speaking of a statue of Justinian, tells us, that brass inferior in colour to gold is almost equal in value to silver. The mines of native brass were very few in number, and were owing entirely to the singular combination of copper and lapis calaminaris in the bowels of the earth, which very seldom occurs; and the ancients were far from being well acquainted with the method of combining these two bodies artificially; so that yellow brass was always esteemed at double the value of copper: and hence, in the ancient coinages, the brass and copper pieces were kept as distinct as those of gold and silver.

Mr Pinkerton challenges to himself the discovery that the imperial sestertius was of brass; and is at considerable pains to bring proofs of it. Besides the testimony of Pliny, which of itself would be decisive, this is supported by the strongest collateral evidence of other authors. From a passage in Julius Africanus, who wrote the [illegible], or *Treatise on Medicine*, it appears that the nummus, or sestertius, weighed an ounce, and of consequence that it could not be silver but brass; and all the large imperial Roman coins weigh an ounce. We know not the age in which Julius Africanu lived; but as he makes the denarius to contain 16 ases, he must have been before the age of Gallienus, when it had 60. Gronovius supposes him to have been the same mentioned by Eusebius. This author speaks of a Julius Africanus who lived in the time of Heliogabulus, and whom Mr Pinkerton supposes to have been the same with him above mentioned.

54 Diminution of the sestertius.

The sestertius underwent no change till the time of Alexander Severus, when it was diminished by one third of its weight. Trajanus Decius was the first who coined double sestertii, or quinarii, of brass; but from the time of Trebonianus Gallus to that of Gallienu, when the first brass ceases, the sestertius does not weigh above the third part of an ounce: the larger coins are accounted double sestertii; and after the time of Gallienus it totally vanishes. In the time of Valerian and Gallienus we find a new kind of coinage, mentioned by the name of *denarii æris*, or *Philippi ærei*. Two sizes of denarii began to be used in the time of Caracalla; the larger of six sestertii, or 24 assaria; the smaller of four sestertii, or 16 assaria as usual. In the time of Pupienus, the latter was reduced to such a small size as not to weigh more than 35 grains; though in Caracalla's time it weighed 56. After the time of Gordian III. the smaller coin fell into disuse, as breeding confusion. The larger denarius of six sestertii, though diminished at last to the size of the early denarius, still retained its value of six sestertii, or 24 assaria. The *Philippus æreus* came at length in place of the sestertius. It was also called *denarius*; from which we may learn not only their size, but that they were in value ten assaria as the first denarius. In the reign of Dioclesian, the place of the sestertius was supplied by the *follis*, that emperor having restored the silver coin to its purity, and likewise given this form to the copper; but it would seem that this restoration of the coinage only took place towards the end of his reign; whence we have but few of his silver coins, and still fewer of the *folles*, though the *denarii ærei* continue quite common down to the time of Constantine. The follis of Dioclesian seems to have weighed above half an ounce; and Mr Pinkerton is of opinion, that Dioclesian designed this coin to supply the place of the denarius æreus; which of course was worth ten assariæ, and six of them went to the silver denarius. From this time the assarium diminishes to the size of 30 grains; and soon after the follis appeared, the denarius æreus was entirely dropped, the former having gradually supplied its place. Some mints appear to have retained the use of the denarius longer than others; and in some the change was preceded, and gradually brought in by washing the follis with silver, or tin, as the denarius had formerly been. Pieces of this kind occur in the times of Dioclesian, Maximian I. and II. and Constantius I.; that is, for about ten years after the follis made its appearance. Some countries, however, retained the denarius æreus; others the follis; and some had a medium betwixt the two, or the follis washed in imitation of the denarius.

55 New coinage introduced by Constantine I.

Towards the end of the reign of Constantine I. a new coinage was introduced throughout the whole empire. The follis coined by this prince was of half an ounce weight; 24 of them going to the milliarensis, or larger silver coin. The word *follis* signifies also a purse, in which sense we sometimes find it mentioned in the Byzantine history. The common follis of silver, when it occurs by itself, means a purse of 250 milliarenses, as the sestertium was 250 denarii; and by a law of Constantine I. every man paid to the state a follis or purse according to his income. The method of counting by purses continues in Turkey to this day.

56 Of the dupondius.

The *dupondius* was only half the value of the sestertius, or about one penny Sterling; and before the yellow brass appeared it seems to have been struck upon copper, and double the size of the as. There are some of this coin, struck in the time of Julius Cæsar, in yellow brass, weighing half an ounce, with a head of Venus Victrix upon one side; on the reverse, a female figure, with serpents at her feet: while others have a Victory on the reverse, with Q. Oppius Pr. After the time of Augustus, the dupondius was struck in yellow brass; which Pliny tells us was also the case in his time. The word dupondiarius seems to have been used by Pliny, and adopted, not to express that the coin was *dupondius*, but that it was of dupondiary value. Neither was the former word confined to signify double weight, but was used also for double length or measure, as in the instance of *dupondius pes*, or two feet, &c. In the imperial

perial times, therefore, *dupondius* was uſed, not to ſignify a coin of double the weight of the as, but of double the value. It was one of the moſt common of the Roman coins; and ſeems to have been very common even in Conſtantinople. In the time of Juſtinian, it ſeems there was a cuſtom of nicknaming young ſtudents of the law *dupondii*, againſt which the emperor made a law; but it is not known what gave riſe to the name. The dupondius, though of the ſame ſize with the as, is commonly of finer workmanſhip, the metal being greatly ſuperior in value. It continues to be of yellow braſs, as well as the ſeſtertius, to the time of Gallienus; but the as is always of copper.

57
Of the aſſarium.

The imperial as, or *aſſarium*, was worth only an halfpenny. At firſt it weighed half an ounce, and was always of copper till the time of Gallienus, when it was made of braſs, and weighed only the eight part of an ounce. From the time of Gallienus to that of Diocleſian, it continued to diminiſh ſtill more, the ſize being then twenty to an ounce. This was the ſame with the lepta, or ſmalleſt coins but the νουμμια, which weighed only ten grains.

58
Parts of the as.

The parts of the as occur but ſeldom; which may, indeed, be well expected, conſidering the low value of it; though there ſtill occur ſome of thoſe called ſemis, triens, quadrans, ſextans, and uncia, coined in the times of Nero and Domitian. There is no ſmall braſs from the time of Pertinax to that of Gallienus, excepting that of Trajanus Decius; but in the time of Gallienus it becomes extremely common; and the coins of ſmall braſs, as well as the larger, are always marked S. C. ſuch as want it being univerſally accounted forgeries, and were plated with ſilver, though the plating be now worn off. The ſmall pieces ſtruck for ſlaves during the time of the ſaturnalia muſt alſo be diſtinguiſhed from the parts of the as. The S. C. upon theſe moſt probably ſignifies *Saturni Conſulto*, and were ſtruck in ridicule of the true coins, as the ſlaves on that occaſion had every privilege of irony.

59
Of the ſmalleſt Roman coins.

The ſeſtertius diminiſhes from Pertinax to Gallienus ſo faſt that no parts of the as are ſtruck, itſelf being ſo ſmall. Trajanus Decius, indeed, coined ſome ſmall pieces, which went for the ſemis of the time. The ſmall braſs coins under Gallienus were called aſſaria, ſixty of which went to the ſilver denarius. They are about the ſize of the denarius, and ſome of them occur of the coinage of Gallus and his family, of half that ſize, which appear to have been ſtruck during the latter part of his reign, when the aſſarium was diminiſhed to a ſtill ſmaller ſize. It is probable, however, that ſome of theſe very ſmall coins had been ſtruck in all ages of the empire, in order to ſcatter among the people on ſolemn occaſions. Mr Pinkerton is of opinion

60
Of the miſſilia.

that they are the *miſſilia*, though moſt other medalliſts think that they were medallions. "But if ſo (ſays our author), they were certainly called *miſſilia a non mittendo*; for it would be odd if fine medallions were ſcattered among the mob. It is a common cuſtom juſt now to ſtrike counters to ſcatter among the populace on ſuch occaſions, while medals are given to peers of the kingdom; and we may very juſtly reaſon from analogy on this occaſion."

The *aſſarion* or *lepton* of the Conſtantinopolitan empire was, as we have already obſerved, one of the ſmalleſt coins known in antiquity, weighing no more than 20 grains; and the *nummi* were the very ſmalleſt which have reached our times, being only one-half of the former. By reaſon of their extreme ſmallneſs, they are very ſcarce; but Mr Pinkerton informs us, that he has in his poſſeſſion a fine one of Theodoſius II. which has on it the emperor's head in profile. Theodoſius P. F. AV.; on the reverſe a wreath, having in the centre VOT. XX.: MULT. XXX.

61
Coins of the lower empire.

The principal coin of the lower empire was the follis, which was divided into an half and quarter, named [illegible] and [illegible]; the latter of which is ſhown by Du Cange to have been a ſmall braſs coin, as the other is ſuppoſed to have been by Mr Pinkerton.—Beſides theſe, the follis was divided into 8 oboli, 16 aſſaria or lepta, and 3[illegible] noumia, though in common computation it contained 40 of theſe laſt. This coin, notwithſtanding ſo many diviſions, was of no more value than an halfpenny.

Mr Pinkerton controverts an opinion, common among medalliſts, that the largeſt braſs coin or follis of the lower empire had 40 ſmall coins, expreſſed by the letter M upon it; the next had 30, expreſſed by the letter Λ; the half by the letter K; and the quarter marked I, which contained only 10. Mr. Pinkerton informs us, that he has three coins of Anaſtaſius, all marked M in large: one of them weighs more than half an ounce; the ſecond 40 grains leſs; and the third of 160 grains, or one-third of an ounce; but the ſize is ſo very unequal, that the laſt, which is very thick, does not appear above half the ſize of the firſt. There are pieces of Juſtinian which weigh a whole ounce; but the ſize of copper was increaſed as the ſilver became ſcarcer; and the value of the coinage cannot be deduced from the weight of the coins, as it is plain that our own coinage is not of half the value with regard to the metal. A great number of medallions were ſtruck by Conſtantius II. but there is no other copper larger than the half ounce, excepting that of Anaſtaſius, when the follis began to be ſtruck larger. All medalliſts allow the others to be medallions.

The metal employed in theſe very ſmall coins, though at firſt of braſs, was always a baſe and refuſe kind; but copper is generally made uſe of in the parts of the as from the earlieſt times to the lateſt; and if braſs be ſometimes employed, it is never ſuch as appears in the ſeſtertii and dupondiarii, which is very fine and beautiful, but only the refuſe. "Yellow braſs of the right ſort (ſays Mr Pinkerton) ſeems totally to have ceaſed in the Roman coinage with the ſeſtertius, under Gallienus, though a few ſmall coins of very bad metal appear under that hue as late as Julian II."

62
Roman ſilver.

Silver was coined in Rome only as late as the 485th year of the city, or 266 B. C. Varro indeed ſpeaks of ſilver having been coined by Servius Tullius, and the libella having been once in ſilver; but Pliny's authority muſt be accounted of more weight than that of this author, as he miſtakes the λιτρα of Sicily for Roman coins, having been current at Rome during the time of the firſt Punic war. Even Pliny, according to our author, very frequently miſtakes with regard to matters much antecedent to his own time; and among

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among the moderns he criticises severely Erasmus and Hume. "Erasmus (says he), who had been in England for some time, talks of leaden money being used here. Not even a leaden token was struck in the reign of Henry VIII.; yet his authority has been followed with due deference to so great a name; for how could Erasmus, who must have seen the matter with his own eyes, assert a direct falsehood? To give a later instance in a writer of reputation, Mr Hume, in vol. vi. of his history, has these words, in treating of the reign of James I. "It appears that copper halfpence and farthings began to be coined in this reign. Tradesmen had commonly carried on their retail business by leaden tokens. The small silver penny was soon lost; and at this time was nowhere to be found." Copper halfpence and farthings were not struck till Charles II. 1672: there were small tokens for farthings struck in copper by James I. but not one for the halfpenny. The silver farthings had ceased with Edward VI. but the silver halfpence continued the sole coins till Charles II. It was by copper tokens that small business was carried on. The silver penny was much used till the end of the reign of George I.; and, so far from being nowhere to be found, is superabundant of every reign since that period, not excepting even the present reign of George III. From these instances the reader may judge how strangely writers of all ages blunder, when treating a subject of which they are entirely ignorant."

63 Denarii when first coined.

The first silver denarii coined at Rome, are supposed by our author to have been those which are impressed with the ROMA; and he inclines to account those the most ancient which have a double female head on the one side, and on the reverse Jupiter in a car, with Victory holding the reins, and the word ROMA indented in a rude and singular manner. The double female head seems to denote Rome, in imitation of the Janus then upon the as. There are 15 of these in the cabinet of Dr Hunter; one of the largest weighs $98\frac{1}{4}$ grains: and the rest, which seem to be of greatest antiquity, are of various weights betwixt that and 84; the smaller and more modern weigh 58 or 59 grains; but Mr Pinkerton is of opinion, that the large ones are of the very first Roman coinage, and struck during that interval of time betwixt the coinage of the first silver denarius and the as of two ounces. He takes the indentation of the word ROMA to be a mark of great antiquity; such a mode being scarcely known any where else, except in Caulonia, Crotona, and other towns of Italy; all of them allowed to be struck at least 400 B. C. As these large coins are not double denarii, they must have been struck prior to the small ones; and Newmann has given an account of one of them recoined by Trajan, in which the indentation of ROMA is carefully preserved. The first denarius was in value 10 asses, when the as weighed three ounces; and allowing 90 grains at a medium for one of these large denarii, the proportion of copper to silver must have been as 1 to 160; but when the as fell to one ounce, the proportion was as 1 to 80: when it fell to half an ounce, so that 16 asses went to the denarius, the proportion was as 1 to 64, at which it remained. Copper with us, in coinage, is to silver as 1 to 40; but in actual value as 1 to 72.

At Rome the denarius was worth 8d.; the quinarius 4d.; and the sestertius, whether silver or brass, 2d. The denarius is the coin from which our penny is derived, and was the chief silver coin in Rome for 600 years. According to Celsus, seven denarii went to the Roman ounce, which in metals did not exceed 430 grains; but as all the denarii hitherto met with weigh at a medium only 60 grains, this would seem to make the Roman ounce only 420 grains; though perhaps this deficiency may be accounted for from the unavoidable waste of metal even in the best preserved of these coins. According to this proportion the Roman pound contained 84 denarii; but in tale there was a very considerable excess; for no fewer than 100 denarii went to the Roman pound. The Greek ounce appears to have been considerably larger than that of Rome, containing about 528 grains; yet notwithstanding this apparently great odds, the difference in the coins was so small, that the Greek money went current in Rome, and the Roman in Greece. The denarius at first went for 10 asses, and was marked X; it was afterwards raised to 16; which Mr Pinkerton supposes to have been about 175 B. C. Some are met with bearing the number XVI. nay, with every number up to CCCCLXXVI. These large numbers are supposed to have been mint-marks of some kind or other. After being raised to 16 ases, it continued at the same value till the time of Gallienus; so that till that time we are to look upon its constituent parts to be 16 ases or assaria, eight dupondii, four brass sestertii, and two silver quinarii. Under the emperor Severus, however, or his successor Caracalla, denarii were struck of two sizes, one of them a third heavier than the common; which we must of consequence suppose to have borne a third more value. This large piece obtained the name of *argenteus*, and *argenteus Philippus*, or the "silver Philip;" the name of Philip having become common to almost every coin. The common denarii now began to be termed *minuti* and *argentei Philippi minutuli*, &c. to express their being smaller than the rest. Some have imagined that the large denarii were of the same value with the small, only of worse metal; but Mr Pinkerton observes, that among the few which have any difference of metal, the smallest are always the worst. The first mention of the *minuti* is in the time of Alexander Severus, who reduced the price of pork from eight minuti at Rome to two and to one. The *minutus argenteus* of that age was about 40 grains; and from the badness of the metal was not worth above 4d. of our money. Thus the price of meat was by this prince reduced first to 8d. and then to 4d.

[63] Value of the denarius and its parts.

64 Restoration of the purity of the Roman coins.

According to Zozimus and other writers, the purity of the Roman coin was restored by Aurelian: but Mr Pinkerton controverts this opinion; thinking it more probable, that he only made the attempt without success; or that his reformation might be entirely confined to gold, on which there is an evident change after the time of this emperor. His successor Tacitus is said to have allowed no brass to be mixed with silver upon any account; yet the few coins of this emperor are very much alloyed. We are certain, however, that the emperor Dioclesian restored the silver to its ancient purity; the denarii struck in his reign being very small indeed, but of as fine silver as the most ancient coins of the empire. After Gordian

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dian III. the ſmall denarius entirely vaniſhed, while the large one was ſo much diminiſhed, that it reſembled the *minutus*, or ſmall one of Caracalla in ſize. Gallienus introduced the *denarii æri* inſtead of the *ſeſtertii*. The *argenteus*, though reduced more than one third in ſize, contained ſix denarii aerei, the old ſtandard of ſeſtertii. According to the writers of this period, and ſome time afterwards, the denarius or argenteus contained 60 aſſaria; whence it follows, that each denarius æreus had 10; and from this it probably had its name. The aſſaria are of the ſize of the argentei already mentioned; and ſhow the copper to have retained nearly its old proportion of value to the ſilver, viz. 1 to 60.

65 Reformation of the ſilver coin by Conſtantine.

A larger ſilver coin was introduced by Conſtantine I. who accommodated the new money to the pound of gold in ſuch a manner, that 1000 of the former in tale were equal to the latter in value; ſo that this new piece from thence obtained the name of the *milliarenſis* or "thouſander." Its weight at a medium is 70 grains, or 70 to the pound of ſilver: but Mr Pinkerton is of opinion, that it might have contained 72 grains, of which two have now periſhed by the ſoftneſs of the ſilver; that the pound contained 72; or that two of the number might be allowed for coinage; while the alloy alone would pay for coining gold. The code ſays, that 60 went to the pound; but the numbers of this are quite corrupt. The *milliarenſis* was worth about a ſhilling ſterling. The argentei or denarii, however, were ſtill the moſt common currency; and having been originally rated at the 100 to the pound of ſilver in tale, they from thence began to be called *centenionales*, or "hundreders." Thoſe of Conſtantine I. and II. Conſtans, and Conſtantius, weigh from 50 grains down to 40; thoſe of Julian and Jovian, from 40 to 30; and of the ſucceeding emperors from that time to Juſtinian, from 30 to 20. Under Heraclius they ceaſed entirely; and from Juſtinian to their total abolition, had been brought down from 15 to 10 grains. A like decreaſe of weight took place in the milliarenſis; thoſe of Conſtantine and Conſtans being above 70 grains in weight; thoſe of Arcadius not above 60; and the milliarenſis of Juſtinian not more than 30 grains; but, from the weight of thoſe in Dr Hunter's cabinet, Mr Pinkerton deduces the medium to have been exactly $70\frac{8}{17}$ grains. These coins were alſo called *majorinæ*.

66 Account of the ſmall Roman coins.

The ſmaller ſilver coins of Rome were, 1. The *quinarius*, at firſt called *victoriatus*, from the image of Victory on its reverſe; and which it continued to bear from firſt to laſt. Its original value was five aſes, but it was afterwards raiſed to eight, when the value of the denarius increaſed to 16. According to Pliny, it was firſt coined in conſequence of the *lex Clodia*, about the 525th year of Rome. Some are of opinion, that it was called κερατιον under the Conſtantinopolitan empire, becauſe it was worth a κερατιον of gold, 144 of which went to the ounce: but this is denied by Mr Pinkerton, becauſe at the time that the word κερατιον firſt appears in hiſtory, the denarius did not weigh above 30 grains; and of conſequence, as 25 muſt have gone to the gold ſolidus, of which there were ſix in the ounce, 130 denarii muſt have gone to the ounce of gold. He is therefore of opinion, that the word κερατιον was only another name for the denarius when much reduced in ſize; probably owing to the great ſcarcity of ſilver in Conſtantinople, though in the ſame city there was plenty of gold; and of conſequence, the gold ſolidus was never diminiſhed. "For Monteſquieu (ſays our author) has well obſerved, that gold muſt be common where ſilver is rare. Hence gold was the common regulation of accounts in the Eaſtern empire." The δινεϱτιον met with in ancient authors, according to Mr Pinkerton, was merely an improper name for the *milliarenſis*; when, on account of the ſcarcity of ſilver, the denarius was reduced, and no milliarenſis coined: ſo that the current milliarenſis of former reigns happened to be double to the denarius or centenonialis. The quinarius diminiſhes in ſize along with the other coins: thoſe of Auguſtus weighing 30 grains, of Severus 25, of Conſtantine I. 20, of Juſtinian 12, and of Heraclius only 5. A new ſilver coinage ſeems to have taken place after the days of this emperor; as the little we then meet with, which in the beſt cabinets ſcarce exceeds a dozen of coins, conſiſts entirely of large unſhapely pieces of coarſe metal.

67 Diviſions of the denarius.

2. The conſular denarius had alſo four ſilver ſeſtertii, till the as fell to half an ounce, when it was thought proper to coin the ſeſtertius in braſs, as it continued to be ever afterwards. "The very laſt ſilver ſeſtertius (ſays Mr Pinkerton) which appears, is one with a head of Mercury, and H. S.; on the reverſe a Caduceus P. SEPVLLIVS; who appears to be the P. SEPVLLIVS MACER of the denarii of Julius Cæſar. If ſo, as is moſt probable, the ſeſtertius was coined in ſilver down to Auguſtus; and it is of courſe not to be expected that any of braſs can appear till Auguſtus, under whom they are actually quite common. I have indeed ſeen no coin which could be a conſular braſs ſeſtertius; and tho' we have certainly braſs dupondii of Cæſar, yet it is reaſonable to infer, that the braſs ſeſtertius was firſt coined by Auguſtus. Not one ſilver ſeſtertius appears during the whole imperial period, yet we know that the ſeſtertius was the moſt common of all ſilver coins. The conſular ſeſtertii of ſilver, marked H. S. are not uncommon, nor the quinarii; but the latter are very ſcarce of all the emperors, if we except one inſtance, the ASIA RECEPTA of Auguſtus.

68 Roman gold.

"The Roman gold coinage was ſtill later than that of ſilver. Pliny tells us, that "gold was coined 62 years after ſilver; and the ſcruple went for 60 ſeſterces. It was afterwards thought proper to coin 40 pieces out of the pound of gold. And our princes have by degrees diminiſhed their weight to 45 in the pound." This account is confirmed by the pieces which ſtill remain; for we have that very coin weighing a ſcruple, which went for 20 ſeſterces. On one ſide is the head of Mars, and on the other an eagle; and it is marked XX. We have another coin of the ſame kind, but double, marked XXXX; and its triple, marked ↓X or 60; the ↓ being the old numeral character for 50." Mr Pinkerton, the diſcoverer of this, treats other medalliſts with great aſperity. Savot and Hardouin are mentioned by name; the latter (he ſays) is "ignorant of common ſenſe;" and neither he nor Savot could explain it but by reading back-

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backward; put the ⅃ for the Roman V, and thus making it xv. Other readings have been given by various medallifts, but none have hit upon the true one excepting our author, though the coin itfelf led to it; being juft three times the weight of that marked XX. We have likewife half the largeft coin, which is marked xxx, and which weighs 26 grains; the fmalleft is only $17\frac{1}{2}$; the xxxx weighs 34; and the LX or drachma 53. There is alfo the didrachm of this coinage, of 106 grains.

69 Account of the aurei.

The *aurei* or Roman gold coins, were at firft 48 in the pound; but they were afterwards diminifhed in number to 40, owing to an augmentation in the weight of each coin. In the time of Sylla, the aureus weighed no lefs than from 164 to 168 grains, and there were only 30 in the pound; but fuch confufion in the coinage was introduced by that conqueror, that no perfon could know exactly what he was worth. Till this time the aureus feems to have continued of the value of 30 filver denarii, about one pound fterling; for about that time it was enlarged a whole third, that it might ftill be equivalent to the full number of denarii. But after Sylla had taken Athens, and the arts and manners of Greece became objects of imitation to the Romans, the aureus fell to 40 in the pound, probably when Sylla had abdicated his dictatorfhip. Thus, being reduced near to the fcale of the Greek *χρυσος*, it paffed for 20 denarii, as the latter did for as many drachmas, being in currency 13s. 4d. fterling. "This (fays Mr Pinkerton) is the more probable, becaufe we know from Suetonius, that the great Cæfar brought from Gaul fo much gold, that it fold for nine times its weight of filver: but the Gallic gold was of a very bafe fort."

In the time of Claudius, the aureus was valued at 100 feftertii, or 25 filver denarii, at which it continued till the time of Heliogabalus, when it fell to about 92 grains at a medium, or rofe in number to 55 in the pound. In the reign of Philip, during which the city completed its thoufandth year, the aureus was coined of two or three fizes. Thefe are impreffed with a head of Rome on one fide, and various figures on the other; but the workmanfhip is fo rude, that they are fuppofed to have been ftruck in fome of the more uncivilized provinces of the empire. The practice of having different gold coins, however, continued under Valerian, Gallienus, and his fucceffors. In the time of Gallienus, they were of 30, 65, and from 86 to 93 grains; the double aurei being from 172 to $183\frac{1}{2}$ grains; but the aureus properly fo called was from 86 to 93; thofe of 30 and 32 being the *trientes aurei* of the *Hiftoriæ Auguftæ Scriptores;* while the larger, from 62 to 65, are to be accounted double trientes, and were perhaps called *minuti aurei*. The value of thefe different fizes of aurei is not known.

70 Alteration in the gold coin made by Aurelian.

That Aurelian made fome alteration in the coin is certain; but Mr Pinkerton fuppofes it to have been only in the gold; becaufe under him and his fucceffor Probus, the common aureus was of 100 grains, a fize confined to thofe emperors: there are likewife halves of about 50 grains; and double aurei, commonly of very fine workmanfhip, of upwards of 200 grains. In the time of Gallienus, the precious metal was fo common, that this emperor vied in magnificence with Nero and Heliogabalus. Aurelian, who plundered the rich city of Palmyra, and thus became mafter of the treafures of the eaft, obtained fuch a profufion of gold, that he looked upon it to be produced by nature in greater plenty than filver. It is remarkable, that during this emperor's reign there was a rebellion among the money-coiners, which could not be quelled but by the deftruction of feveral thoufands; which Mr Pinkerton afcribes to his having ordered the gold to be reftored to its former fize, but to go for no more filver than it formerly did. "So very little filver (fays he) occurs of this period, that it is plain no alteration in the filver produced the war with the moneyers: and in the brafs he made no change; or if he had, it were ftrange that fuch commotions fhould arife about fo trifling a metal. But if, as appears from the coins, he ordered the aureus, which had fallen to 80 grains, to be raifed to about 100, it is no wonder that the contractors fhould be in an uproar; for a whole quarter of their coinage, amounting as would feem to all their profits, was loft. Aurelian judged, that when he found gold fo common in the eaft, it was equally fo in the weft; and that the moneyers muft have made a moft exorbitant profit; but his ideas on this fubject were partial and unjuft: and after his fhort reign, which did not exceed five months after the alteration, the gold returned to its former courfe; though a few pieces occur of Aurelian's ftandard, ftruck, as would feem, in the commencement of the reign of Probus his fucceffor.

From this time to that of Conftantine I. the aureus weighed between 70 and 80 grains; but in his reign it was changed for the folidus, of which fix went to the ounce of gold, which went for 14 milliarenfes, and 25 denarii as before; the value of filver being now to gold as 14 to 1. This new coin continued of the fame value to the final downfal of the Conftantinopolitan empire; gold being always very plentiful in that city, though filver became more and more fcarce. The folidus was worth 12s. fterling. Here again our author moft feverely criticifes Mr Clarke and Mr Raper: the former (he fays) with refpect to the value of gold in the time of Conftantine I. "has left all his fenfes behind him. In page 267. he abfurdly afferts, that 20 denarii went to the folidus in the time of Theodofius I. and proceeds with this deplorable error to the end of his work. He then tells us, that only 14 denarii went to the folidus under Conftantine I. &c." To Mr Raper, however, he is a little more merciful, as he owns, that "though he (Mr Raper) has ftrangely confounded the milliarenfis with the denarius, he has yet kept common fenfe for his guide." Mr Pinkerton argues, indeed with great probability, "that had any change in the coinage taken place between the time of Conftantine and Theodofius I. that is, in lefs than 50 years, the laws of that period, which are all in the Theodofian code, muft have noticed it." To this and other arguments upon the fubject, Mr Pinkerton adds the following obfervation upon the value of gold and filver: "As a ftate advances to its height, gold increafes in value; and as a ftate declines, it decreafes, providing the metals are kept on a par as to purity. Hence we may argue, that gold decreafed in its relation to filver perhaps four or five centuries, furnifhed moft European kingdoms with gold in coin, which otherwife would, from their want of arts, and of

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of intercourse with the east, then the grand seminary of that metal, have almost been ignorant of what gold was. These gold coins were called *Bezants* in Europe, because sent from Byzantium or Constantinople; and were *solidi* of the old scale, six to the ounce. In Byzantine writers, the solidus is also called *nomisma*, or "the coin;" *crysinos*, because of gold; *hyperperos*, from its being refined with fire, or from its being of bright gold flaming like fire. The *solidi* also, as the *aurei* formerly, received names from the princes whose portraits they bore; as *Michelati*, *Manuelati*. *Solidus* is a term used also for the aureus by Apuleius, who lived in the time of Antoninus the Philosopher; nay, as early as in the Prætorian edicts of the time of Trajan. It was then a distinction from the semissis or half. In the time of Valerian, when aurei of different sizes had been introduced, it became necessary to distinguish the particular aurei meant. Hence in the Imperial Rescripts, published by the *Historiæ Augustæ Scriptores*, Valerian uses the term *Philippeos nostri vultus*, for the common aurei. Aurelian uses the same term *aurei Philippei*, for the aurei which he had restored to their size in some degree. Gallienus uses *aurei Valeriani* for his father's coins. *Aurei Antoniniani* are likewise put by Valerian for coins of the early Antonini, of superior standard to any then used.

71 Divisions of the aureus.

In the first gold coinage at Rome, the aureus was divided into four parts; the semissis of 60 sestertii; the tremissis, or third, of 40; the fourth, the name of which is not mentioned, of 30; and the scrupulum of 20. But in a short time all of these fell into disuse, except the semissis or half, which is extremely scarce; so that it is probable that few have been struck. It is an erroneous opinion (according to Mr Pinkerton) that the semissis was called a *denarius aureus*. The aureus itself indeed had this name; but the name of *quinarius* is applied to the semissis with greater propriety than the former. Trientes, or tremisses of gold, are found of Valerian and his son Gallienus, and weigh about 30 grains. Those of Salonina the wife of Gallienus weigh 33 grains. Under the Constantinopolitan empire, tremisses again make their appearance; and from the time of Valentinian downwards, the thirds are the most common coins of gold, being worth about 4s. sterling. The semissis is likewise mentioned, but none occur earlier than the time of Basiliscus. The gold tremissis was the pattern of the French and Spanish gold coins; as the silver denarius, in its diminished state, was of the Gothic and Saxon penny.

72 Account of the Roman method of coining

We shall close this account of the Roman money with some remarks concerning the mint, and method of coinage. This at first seems to have been under the direction of the quæstor. About the time that silver was first coined in Rome, *viz.* about 266 B. C. the *triumviri monetales* were created. They were at first of senatorial rank, but were by Augustus chosen from among the equestrian; and the title of *triumviri* was continued till after the time of Caracalla; but under Aurelian there was probably but one master of the mint called *Rationalis*; and Mr Pinkerton is of opinion that the change took place under Gallienus. He seems also to have permitted the provincial cities to coin gold and silver, as well as to have altered the form of the mints in the capital, and to have ordered them all to strike money with Latin legends, and of the same forms; as in his time we first meet with coins with mint-marks of cities and offices. The violent insurrection which took place in his reign has already been mentioned, as well as its probable cause; and Mr Gibbon has shown, that the concealed enemies of Aurelian took such advantage of this insurrection, that it cost 7000 of his best troops before it could be quelled. About this time the *procurator monetæ* seems to have succeeded the *rationalis* as director of the mint. In the colonies, the direction of the mint seems to have been given to the decemviri, whose names frequently occur on colonial coins; "which (says Mr Pinkerton), though generally of rude invention, and ruder execution, are yet often interesting and important."

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The engraving of the ancient dyes used in coinage was a work of much genius and labour; and at Rome Greek artists were generally employed in it; but it has been thought a matter of great surprise, that scarce any two ancient coins are to be found exactly the same. Hence some antiquaries have imagined, that only a single coin was thrown off from each dye. M. Beauvais informs us, that the only two Roman imperial coins of the first times which he had seen perfectly alike were those of the Emperor Galba. It is, however, the opinion of the best judges, that a perfect similarity betwixt two medals is a very great reason for supposing one of them to be forged. "It must also be observed (says Mr Pinkerton), that the differences in coins, apparently from the same dye, are often so minute as to escape an eye not used to microscopic observations of this sort. But it would be surprising if any two ancient coins were now found struck with the same dye; for out of each million issued, not above one has reached us. Dyes soon give way by the violence of the work; and the ancients had no puncheons nor matrices, but were forced to engrave many dyes for the same coin. Even in our mint, upon sending for a shilling's worth of new halfpence, it will appear that three or four dyes have been used. Sometimes the obverse of the dye gives way, sometimes the reverse; but among us it is renewed by puncheons, though with variations in the lettering or other minute strokes; while the ancients were forced to recur to another dye differently engraven. The engravers of the dye were called *cælatores*; other officers employed in the mint were the *spectatores*, *expectatores*, or *nummularii*. The melters were styled *fusarii*, *flatuarii*, and *flaturarii*; those who adjusted the weight were called *æquatores monetarum*; those who put the pieces into the dye *suppositores*, and those who struck them *malleatores*. At the head of each office was an officer named *primicerius*, and the foreman was named *optio et exactor*."

In order to assist the high relief on the coins, the metal, after being melted and refined, was cast into bullets, as appears from the ancient coins not being cut or filed on the edges, but often cracked, and always rough and unequal. These bullets were then put into the dye, and received the impression by repeated strokes of the hammer, though sometimes a machine appears to have been used for this purpose: for Boiterue informs us, that there was a picture of the Roman mintage in a grotto near Baiæ, where a machine was represented holding up a large stone as if to let it fall suddenly, and strike the coin at once. None of the ancient money was cast in moulds, excepting

Preſervation. ing the moſt ancient and very large Roman braſs, commonly called *weights*, and other Italian pieces of that ſort; all the reſt being mere forgeries of ancient and modern times. Some Roman moulds which have been found are a proof of this; and from theſe ſome medalliſts have erroneouſly imagined that the ancients firſt caſt their money in moulds, and then ſtamped it, in order to make the impreſſion more clear and ſharp.

The ancients had ſome knowledge of the method of crenating the edges of their coins, which they did by cutting out regular notches upon them; and of this kind we find ſome of the Syrian and ancient conſular coins, with a few others. The former were caſt in this ſhape, and then ſtruck; but the latter were crenated by inciſion, to prevent forgery, by ſhowing the inſide of the metal: however, the ancient forgers alſo found out a method of imitating this; for Mr Pinkerton informs us, that he had a Roman conſular coin, of which the inciſions, like the reſt, were plated with ſilver over the copper.

Sect. VI. *Of the Preſervation of Medals.*

We now come to conſider what it is that diſtinguiſhes one medal from another, and why ſome are ſo highly prized more than others. This, in general, beſides its genuineneſs, conſiſts in the high degree of preſervation in which it is. This, by Mr Pinkerton, is called the *conſervation* of medals, and is by him regarded as *good* and as *perfect*. In this, he ſays that a true judge is ſo nice, that he will reject even the rareſt coins if in the leaſt defaced either in the figures or legend. Some, however, are obliged to content themſelves with thoſe which are a little rubbed, while thoſe of ſuperior taſte and abilities have in their cabinets only ſuch as are in the very ſtate in which they came from the mint; and ſuch, he ſays, are the cabinets of Sir Robert Auſtin, and Mr Walpole of Roman ſilver at Strawberryhill. It is abſolutely neceſſary, however, that a coin be in what is called *good* preſervation; which in the Greek or Roman emperors, and the colonial coins, is ſuppoſed to be when the legends can be read with ſome difficulty; but when the conſervation is perfect, and the coin juſt as it came from the mint, even the moſt common coins are valuable.

73 Braſs and copper beſt preſerved by the ruſt that covers them.

The fine ruſt, like varniſh, which covers the ſurface of braſs and copper coins, is found to be the beſt preſerver of them; and is brought on by lying in a certain kind of ſoil. Gold cannot be contaminated but by iron mold, which happens when the coin lies in a ſoil impregnated with iron; but ſilver is ſuſceptible of various kinds of ruſt, principally green and red; both of which yield to vinegar. In gold and ſilver coins the ruſt muſt be removed, as being prejudicial; but in braſs and copper it is preſervative and ornamental; a circumſtance taken notice of by the

74 Different kinds of this ruſt.

ancients. "This fine ruſt (ſays Mr Pinkerton), which is indeed a natural varniſh not imitable by the art of man, is ſometimes a delicate blue, like that of a turquoiſe; ſometimes of a bronze brown, equal to that obſervable in ancient ſtatues of bronze, and ſo highly prized; and ſometimes of an exquiſite green, a little on the azure hue, which laſt is the moſt beautiful of all. It is alſo found of a fine purple, of olive, and of a cream colour or pale yellow: which laſt is exquiſite, and ſhows the impreſſion to as much advantage as paper of cream colour, uſed in all great foreign preſſes, does copperplates and printing. The Neapolitan patina (the ruſt in queſtion) is of a light green; and when free from excreſcence or blemiſh is very beautiful. Sometimes the purple patina gleams thro' an upper coat of another colour, with as fine effect as a variegated ſilk or gem. In a few inſtances a ruſt of a deeper green is found; and it is ſometimes ſpotted with the red or bronze ſhade, which gives it quite the appearance of the Eaſt Indian ſtone called the *blood-ſtone*. Theſe ruſts are all, when the real product of time, as hard as the metal itſelf, and preſerve it much better than any artificial varniſh could have done; concealing at the ſame time not the moſt minute particle of the impreſſion of the coin."

75 Medals how diminiſhed in value.

The value of medals is lowered when any of the letters of the legend are miſplaced; as a ſuſpicion of forgery is thus induced. Such is the caſe with many of thoſe of Claudius Gothicus. The ſame, or even greater, diminution in value takes place in ſuch coins as have not been well fixed in the dye, which has occaſioned their ſlipping under the ſtrokes of the hammer, and thus made a double or triple image. Many coins of this kind are found in which the one ſide is perfectly well-formed, but the other blundered in the manner juſt mentioned. Another blemiſh, but of ſmaller moment, and which to ſome may be rather a recommendation, is when the workmen through inattention have put another coin into the dye without taking out the former. Thus the coin is convex on one ſide, and concave on the other, having the ſame figure upon both its ſides.

75 Countermarked medals.

The medals ſaid by the judges in this ſcience to be *countermarked* are very rare, and highly valued. They have a ſmall ſtamp impreſſed upon them, in ſome an head, in others a few letters, ſuch as Aug: N. PROBUS, &c. which marks are ſuppoſed to imply an alteration in the value of the coin; as was the caſe with the countermarked coins of Henry VIII. and Queen Mary of Scotland. Some have a ſmall hole through them; ſometimes with a little ring faſtened in it, having been uſed as ornaments; but this makes no alteration in their value. Neither is it any diminution in the value of a coin that it is ſplit at the edges; for coins of undoubted antiquity have often been found in this ſtate, the cauſe of which has already been explained. On the contrary, this cracking is generally conſidered as a great merit; but Mr Pinkerton ſuſpects that one of theſe cracked coins has given riſe to an error with reſpect to the wife of Carauſius who reigned for ſome time in Britain. The inſcription is read ORIUNA Aug: and there is a crack in the medal juſt before the O of oriuna. Without this crack Mr Pinkerton ſuppoſes that it would have been read FORTUNA Aug.

76 Silver and gold how tarniſhed.

Some particular ſoils have the property of giving ſilver a yellow colour as if it had been gilt. It naturally acquires a black colour through time, which any ſulphureous vapour will bring on in a few minutes From its being ſo ſuſceptible of injuries, it was always mixed by the ancients with much alloy, in order to harden it. Hence the impreſſions of the ancient ſilver coins remain perfect to this day, while thoſe of modern coins are obliterated in a few years. On this ac-

Preſervation. account Mr Pinkerton expreſſes a wiſh, that modern ſtates would allow a much greater proportion of alloy in their ſilver coin than they uſually do. As gold admits of no ruſt except that from iron above mentioned, the coins of this metal are generally in perfect conſervation, and freſh as from the mint.

77 How to cleanſe them. To cleanſe gold coins from this ruſt, it is beſt to ſteep them in aquafortis, which, though a very powerful ſolvent of other metals, has no effect upon gold. Silver may be cleanſed by ſteeping for a day or two in vinegar, but more effectually by boiling in water with three parts of tartar and one of ſea-ſalt; on both theſe metals, however, the ruſt is always in ſpots, and never forms an entire incruſtation as on braſs or copper. The coins of theſe two metals muſt never be cleanſed, as they would thus be rendered full of ſmall holes eaten by the ruſt. Sometimes, however, they are found ſo totally obſcured with ruſt, that nothing can be diſcovered upon them; in which caſe it is beſt to clear them with a graver; but it may alſo be done by boiling them for 24 hours in water with three parts of tartar and one of alum; not ſea-ſalt as in ſilver coins.

78 Why ancient coins are in ſuch an high ſtate of preſervation. The high ſtate of preſervation in which ancient coins are uſually found, is thus accounted for by Mr Hancarville. He obſerves, that the chief reaſon is the cuſtom of the ancients always to bury one or more coins with their dead, in order to pay for their paſſage over the river Styx. "From Phidon of Argos (ſays he) to Conſtantine I. are 36 generations: and from Magna Græcia to the Euphrates, from Cyrene to the Euxine Sea, Grecian arts prevailed, and the inhabitants amounted to about 30,000,000. There died therefore, in that time and region, not leſs than ten thouſand millions of people, all of whom had coins of one ſort or other buried with them. The tombs were ſacred and untouched; and afterwards neglected, till modern curioſity or chance began to diſcloſe them. The urn of Flavia Valentina, in Mr Towley's capital collection, contained ſeven braſs coins of Antoninus Pius and Eleagabalus. Such are generally black, from being burnt with the dead. The beſt and freſheſt coins were uſed on theſe occaſions from reſpect to the dead; and hence their fine conſervation. At Syracuſe a ſkeleton was found in a tomb, with a beautiful gold coin in its mouth; and innumerable other inſtances might be given, for hardly is a funeral urn found without coins. Other incidents alſo conſpire to furniſh us with numbers of ancient coins, though the above recited circumſtance be the chief cauſe of perfect conſervation. In Sicily, the ſilver coins with the head of Proſerpine were found in ſuch numbers as to weigh 600 French livres or pounds. In the 16th century, 60,000 Roman coins were found at Modena, thought to be a military cheſt hid after the battle of Bedriacum, when Otho was defeated by Vitellius. Near Breſt, in the year 1760, between 20 and 30,000 Roman coins were found. A treaſure of gold coins of Lyſimachus was found at Deva on the Marus; and Strabo, lib. vii. and Pauſan *in Attic.* tell that he was defeated by the Getæ; at which time this treaſure ſeems to have fallen into their hands."

79 Number of ancient coins. Thus Mr Pinkerton, from the authority of Mr Hancarville and others: but conſidering theſe vaſt numbers of coins found in various places, it ſeems ſurpriſing how ſo few ſhould now remain in the cabinets of the curious, as the ſame author informs us that the whole of the different ancient coins known to us amount only to about 80,000, though he owns that the calculation cannot be eſteemed accurate.

Sect. VII. *How to diſtinguiſh true Medals from counterfeits.*

How to diſtinguiſh true from counterfeits. The moſt difficult and the moſt important thing in the whole ſcience of medals is the method of diſtinguiſhing the true from the counterfeit. The value put upon ancient coins made the forgery of them almoſt coeval with the ſcience itſelf; and as no laws inflict a puniſhment upon ſuch forgers, men of great genius and abilities have undertaken the trade: but whether to the real detriment of the ſcience or not, is a matter of ſome doubt; for if only exact copies of genuine medals are ſold for the originals, the impoſition may be deemed trifling: but the caſe muſt be accounted very different, if people take it upon them to forge medals which never exiſted. At firſt the forgeries were extremely groſs; and medals were forged of Priam, of Ariſtotle, Artemiſia, Hannibal, and moſt of the other illuſtrious perſonages of antiquity. Moſt of theſe were done in ſuch a manner, that the fraud could eaſily be diſcovered; but others have impoſed even upon very learned men. Mr Pinkerton mentions a remarkable medal of the emperor Heraclius, repreſenting him in a chariot on the reverſe, with Greek and Latin inſcriptions, which Joſeph Scaliger and Lipſius imagined to have been ſtruck in his own time, but which was certainly iſſued in Italy in the 15th century. "Other learned men (ſays our author) have been ſtrangely miſled, when ſpeaking of coins; for to be learned in one ſubject excludes not groſs ignorance in others. Budæus, de Aſſe, quotes a denarius of Cicero, M. TULL.. Eraſmus, in one of his Epiſtles, tells us with great gravity, that the gold coin of Brutus, ſtruck in Thrace, ΚΟΣΩΝ, bears the patriarch Noah coming out of the ark with his two ſons, and takes the Roman eagle for the dove with the olive branch. Winkelman, in his letters, informs us, that the ſmall braſs piece with Virgil's head, reverſe EPO, is undoubtedly ancient Roman; and adds, that no knowledge of coins can be had out of Rome: but Winkelman, ſo converſant in ſtatues, knew nothing of coins. It is from other artiſts and other productions that any danger of deceit ariſes. And there is no wonder that even the ſkilful are miſled by ſuch artiſts as have uſed this trade; for among them appear 80 Coins forged by excellent artiſts. the names of Victor Gambello, Giovani del Cavino, called the PADUAN, and his ſon Aleſſandro Baſſiano, likewiſe of Padua, Benvenuto Cellini, Aleſſandro Greco, Leo Aretino, Jacobo da Frezzo, Federigo Bonzagna, and Giovani Jacopo, his brother; Sebaſtiano Plumbo, Valerio de Vicenza, Gorlæus a German, Carteron of Holland, and others, all or moſt of them of the 16th century; and Cavino the Paduan, who is the moſt famous, lived in the middle of that century. The forgeries of Cavino are held in no little eſteem, being of wonderful execution. His and thoſe of Carteron are the moſt numerous, many of the other artiſts here mentioned not having forged above two or three coins. Later forgers were

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were Dervieu of Florence who confined himself to medallions, and Cogornier who gave coins of the 30 tyrants in small brass. The chief part of the forgeries of Greek medals which have come to my knowledge are of the first mentioned, and a very gross kind, representing persons who could never appear upon coin, such as Priam, Æneas, Plato, Alcibiades, Artemisia, and others. The real Greek coins were very little known or valued till the works of Goltzius appeared, which were happily posterior to the æra of the grand forgers. Why later forgers have seldom thought of counterfeiting them cannot easily be accounted for, if it is not owing to the masterly workmanship of the originals, which sets all imitation at defiance. Forgeries, however, of most ancient coins may be met with, and of the Greek among the rest.

81
Roman forgeries more conspicuous than Greek ones.

"The forgeries are more conspicuous among the Roman medals than any other kind of coins; but we are not to look upon all these as the work of modern artists. On the contrary, we are assured that many of them were fabricated in the times of the Romans themselves, some of them being even held in more estimation than the genuine coins themselves, on account of their being plated, and otherwise executed in a manner to which modern forgers could never attain. Even the ancients held some of these counterfeits in such estimation, that Pliny informs us there were frequently many true denarii given for one false one."—Caracalla is said to have coined money of copper and lead plated with silver; and plated coins, the work of ancient forgers, occur of many Greek cities and princes; nay, there are even forgeries of barbaric coins. "Some Roman coins (says Mr Pinkerton) are found of iron or lead plated with brass, perhaps trials of the skill of the forger. Iron is the most common; but one decursio of Nero is known of lead plated with copper. Neumann justly observes, that no historic faith can be put in plated coins, and that most faulty reverses, &c arise from plated coins not being noticed as such. Even of the Roman consular coins

82
Denarius of Brutus.

not very many have ever been forged. The celebrated silver denarius of Brutus, with the cap of liberty and two daggers, is the chief instance of a consular coin of which a counterfeit is known. But it is easily rejected by this mark: in the true coin the cap of liberty is below the guard or hilt of the daggers; in the false, the top of it rises above that hilt."

83
Imperial medals.

The imperial series of medals is the grand object of modern medallic forgeries; and the deception was at first extended to the most eminent writers upon the subject. The counterfeits are by Mr Pinkerton divided into six classes:

I. Such as are known to be imitations, but valued on account of the artists by which they are executed. In this class the medals of the Paduan rank highest; the others being so numerous, that a complete series of imperial medals of almost every kind, nay almost of every medallion, may be formed from among them. In France, particularly, by far the greater part of the cabinets are filled with counterfeits of this kind. They are distinguished from such as are genuine by the following marks: 1. The counterfeits are almost universally thinner. 2. They are never worn nor damaged. 3. The letters are modern. 4. They are either destitute of varnish entirely, or have a false one, which is easily known by its being black, shining, and greasy, and very easily hurt with the touch of a needle, while the varnish of ancient medals is as hard as the metal itself. Instead of the greasy black varnish above mentioned, indeed, they have sometimes a light green one, spotted with a kind of iron marks, and is composed of sulphur, verdigrease, and vinegar. It may frequently be distinguished by the hairstrokes of the pencil with which it was laid on being visible upon it. 5. The sides are either filed or too much smoothed by art, or bear the marks of a small hammer 6. The counterfeits are always exactly circular, which is not the case with ancient medals, especially after the time of Trajan.

84
Paduan forgeries how known.

The Paduan forgeries may be distinguished from those of inferior artists by the following marks: 1. The former are seldom thinner than the ancient. 2. They very seldom appear as worn or damaged, but the others very frequently, especially in the reverse, and legend of the reverse, which sometimes, as in forged Othos, appear as half consumed by time. 3. The letters in moulds taken from the antique coins have the rudeness of antiquity. 4. False varnish is commonly light green or black, and shines too much or too little. 5. The sides of forged coins are frequently quite smooth, and undistinguishable from the ancient, though to accomplish this requires but little art. 6. Counterfeit medals are frequently as irregular in their form as the genuine; but the Paduan are generally circular, though false coins have often little pieces cut off, in perfect imitation of the genuine. 7. In cast coins the letters do not go sharp down into the metal, and have no fixed outline; their minute angles, as well as those of the drapery, are commonly filled up, and have not the sharpness of the genuine kind. Where the letters or figures are faint, the coin is greatly to be suspected.

85
Letters the principal criterion of medals.

The letters form the great criterion of medals, the ancient being very rude, but the modern otherwise; the reason of which, according to Cellini, is, that the ancients engraved all their matrices with the graver or burin, while the modern forgers strike theirs with a punch.

86
Vico's account of false patina.

According to Vico, the false patina is green, black, russet, brown, grey, and iron-colour. The green is made from verdigrease, the black is the smoke of sulphur, the grey is made of chalk steeped in urine, the coin being left for some days in the mixture. The russet is next to the natural, by reason of its being a kind of froth which the fire forces from ancient coins; but when false, it shines too much. To make it they frequently took the large brass coins of the Ptolemies, which were often corroded, and made them red hot in the fire; put the coins upon them, and a fine patina adhered. Our author does not say in what manner the iron-covered patina was made. "Sometimes (adds he) they take an old defaced coin, covered with real patina, and stamp it anew; but the patina is then too bright in the cavities, and too dull in the protuberances. The trial of brass coins with the tongue is not to be despised; for if modern the patina tastes bitter or pungent, while if ancient it is quite tasteless."

Mr Pinkerton informs us, that all medallions from Julius Cæsar to Adrian are much to be suspected of forgery; the true medals of the first 14 emperors being

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ing exceedingly valuable, and to be found only in the cabinets of princes.

87 Medals cast from the Paduan forgeries.

II. The second class of counterfeit medals contains those cast from moulds taken from the Paduan forgeries, and others done by eminent masters. These are sometimes more difficult to be discovered than the former, because in casting them they can give any degree of thickness they please; and, filling the small sand-holes with mastic, they retouch the letters with a graver, and cover the whole with varnish. The instructions already given for the former class, however, are also useful for those of the second, with this addition, that medals of this class are generally lighter than the genuine, because fire rarefies the metal in some degree, while that which is struck is rather condensed by the strokes. In gold and silver medals there cannot be any deception of this kind; because these metals admit not of patina, and consequently the varnish betrays the imposition. The marks of the file on the margin of those of the second class are a certain sign of forgery; though these do not always indicate the forgery to be of modern date, because the Romans often filed the edges of coins to accommodate them to the purposes of ornament, as quarter guineas are sometimes put into the bottom of punch laddles. It is common to imitate the holes of medals made by time by means of aqua-fortis; but this destroys the sides of a coin more effectually than if it had been eat into naturally. The fraud, however, is not easily distinguished.

88 Medals cast from an antique.

III. *Medals cast in moulds from an antique.*—In this mode some forgers, as Beauvais informs us, have been so very careful, that they would melt a common medal of the emperor whom they meant to counterfeit, lest the quality of the metal should betray them. "This (says Mr Pinkerton) has been done in the silver Septimius Severus, with the reverse of a triumphal arch, for which a common coin of the same prince has been melted; and in other instances. Putting metals in the fire or upon hot iron to cleanse them, gives them an appearance of being cast; for some spots of the metal being softer than the rest will run, which makes this one of the worst methods of cleaning medals.— The directions given for discovering the two former deceptions hold good also in this.

89 Ancient medals retouched.

IV. *Ancient medals retouched and altered.*—This is a class of counterfeits more difficult to be discovered than any other. "The art (says Mr Pinkerton) exerted in this class is astonishing; and a connoisseur is the less apt to suspect it, because the coins themselves are in fact ancient. The acute minds of the Italian artists exerted themselves in this way, when the other forgeries became common and known. With graving tools they alter the portraits, the reverses, and the inscriptions themselves, in a surprising manner. Of a Claudius struck at Antioch they make an Otho; of a Faustina, a Titiana; of a Julia Severa, a Didia Clara; of a Macrinus, a Pescennius, &c. Give them a Marcus Aurelius, he starts up a Pertinax, by thickening the beard a little, and enlarging the nose. In short, wherever there is the least resemblance in persons, reverses, or legends, an artist may from a trivial medal generate a most scarce and valuable one. This fraud is distinguishable by the false varnish which sometimes masks it; but, above all, by the letters of the legend, which are always altered. Though this be sometimes done with an artifice almost miraculous, yet most commonly the characters straggle, are disunited, and not in a line."

In counterfeits of this kind sometimes the obverse is not touched, but the reverse made hollow, and filled with mastic coloured like the coin, and engraven with such device and legend as was most likely to bring a great price; others are only retouched in some minute parts, by which, however, the value of the coin is much diminished. "Against all these arts (says Mr Pinkerton), severe scrutiny must be made by the purchaser upon the medal itself; and the investigation and opinion of eminent antiquaries had upon its being altered, or genuine as it is issued from the mint.

90 Medals with new devices, or soldered.

V. *Medals impressed with new devices, or soldered.*—In the first article of this class the reverses have been totally filed off, and new ones impressed with a dye and hammer. This is done by putting the face or obverse, whichever is not touched, upon different folds of pasteboard, afterwards applying the dye and striking it with a hammer. The forgery in this class is very easily discovered, as the devices and inscriptions on the counterfeits are known not to exist on true medals: as the Pons Ælius on the reverse of Adrian; the Expeditio Judaica of the same emperor, &c. The difference of fabrication in the face or reverse will be discovered at the first glance by any person of skill.

The soldered medals consist of two halves belonging to different medals, sawed through the middle and then joined with solder. This mode of counterfeiting is common in silver and brass coins. "They will take an Antoninus, for example, and saw off the reverse, then solder to the obverse which they have treated in the same manner. This makes a medal, which, from an unknowing purchaser, will bring an hundred times the price of the two coins which compose it. When the deceit is used in brass coins, they take care that the metals be of one hue; though indeed some pretenders in this way sometimes solder copper and brass together, which at once reveals the deceit. Medals which have a portrait on each side, and which are generally valuable, are the most liable to a suspicion of this fraud. To a very nice eye the minute ring of solder is always visible; and upon inserting a graver, the fabrication falls into halves."

In the same manner reverses are sometimes soldered to faces not originally belonging to them; as one mentioned by Pere Jobert of Domitian with an amphitheatre, a reverse of Titus joined to it. Another art is sometimes made use of in this kind of counterfeits, of which there is an instance of the temple of Janus upon Nero's medals; where the middle brass is taken off, and inserted in a cavity made in the middle of a large coin of that prince. In the coins of the lower empire, however, the reverses of medals are sometimes so connected with their obverses, that a suspicion of forgery sometimes occurs without any foundation. They are met with most commonly after the time of Gallienus, when such a number of usurpers arose, that it was difficult to obtain an exact portrait of their features; the coiners had not time, therefore, to strike a medal for these as they could have done for other emperors who reigned longer. Hence, on the reverse

How to diſtinguiſh true from counterfeits. of a medal of Marius, who reigned only three days, there is PACATOR ORBIS, which ſhows that at that time they had reverſes ready fabricated, to be applied as occaſion might require.

91 Plated medals, &c. VI. *Plated medals, or thoſe which have clefts.*—It has been already remarked, that many true medals are cracked in the edges; owing to the repeated ſtrokes of the hammer, and the little degree of ductility which the metal poſſeſſes. This the forgers attempt to imitate by a file; but it is eaſy to diſtinguiſh betwixt the natural and artificial cleft by means of a ſmall needle. The natural cleft is wide at the extremity, and appears to have a kind of almoſt imperceptible filaments; the edges of the crack correſponding with each other in a manner which no art can imitate.

The plated medals which have been forged in ancient times were long ſuppoſed to be capable of reſiſting every effort of modern imitation; but of late years, "ſome ingenious rogues (ſays Mr Pinkerton) thought of piercing falſe medals of ſilver with a red hot needle, which gave a blackneſs to the inſide of the coin, and made it appear plated to an injudicious eye. This fraud is eaſily diſtinguiſhed by ſcraping the inſide of the metal." It is, however, very difficult to diſtinguiſh the forgeries of rude money when not caſt; and our author gives no other direction than to conſult a ſkilful medalliſt. Indeed, notwithſtanding all the directions already given, this ſeems to be a reſource which cannot by any means with ſafety be neglected.

92 Mr Pinkerton's directions for knowing medals. A real and practical knowledge of coins "is only to be acquired (ſays he) by ſeeing a great number, and comparing the forged with the genuine. It cannot therefore be too much recommended to the young connoiſſeur, who wiſhes to acquire ſome knowledge in this way, to viſit all the ſales and cabinets he can, and to look upon all ancient medals with a very microſcopic eye. By theſe means only is to be acquired that ready knowledge which enables at firſt glance to pronounce upon a forgery, however ingenious. Nor let the ſcience of medals be from this concluded to be uncertain; for no knowledge is more certain and immediate, when it is properly ſtudied by examination of the real objects. A man who buys coins, truſting merely to his theoretic peruſal of medallic books, will find himſelf woefully miſtaken. He ought to ſtudy coins firſt, where only they can be ſtudied, in themſelves. Nor can it be matter of wonder or implication of caprice, that a medalliſt of ſkill ſhould at one perception pronounce upon the veracity or falſehood of a medal; for the powers of the human eye, employed in certain lines of ſcience, are amazing. Hence a ſtudent can diſtinguiſh a book among a thouſand ſimilar, and quite alike to every other eye: hence a ſhepherd can diſcern, &c.: hence the medalliſt can

93 Forgeries of modern coins. ſay in an inſtant, 'this is a true coin, and this is a falſe,' though to other people no diſtinction be perceptible."

Forgeries of modern coins and medals, Mr Pinkerton obſerves, are almoſt as numerous as of the ancient. The ſatyric coin of Louis XII. PERDAM BABYLONIS NOMEN, is a remarkable inſtance: the falſe coin is larger than the true, and bears date 1512. The rude coins of the middle ages are very eaſily forged, and forgeries have accordingly become common. Forged coins of Alfred and other early princes of England have appeared, ſome of which have been done with great art. "The two noted Engliſh pennies of Rich. I. ſays our author, are of this ſtamp; and yet have impoſed upon Meſſrs Folkes and Snelling, who have publiſhed them as genuine in the two beſt books upon Engliſh coins. But they were fabricated by the late Mr White of Newgate-ſtreet, a noted collector, who contaminated an otherwiſe fair character by ſuch practices. Such forgeries, though eaſy, require a ſkill in the hiſtory and coinage of the times which luckily can hardly fall to the lot of a common Jew or mechanic forger. But the practice is deteſtable, were no gain propoſed: and they who ſtoop to it muſt ſuppoſe, that to embarraſs the path of any ſcience with forgery and futility, implies no infamy. In forgeries of ancient coin, the fiction is perhaps ſufficiently atoned for by the vaſt ſkill required; and the artiſt may plauſibly allege, that his attention was not to deceive, but to excite his utmoſt powers, by an attempt to rival the ancient maſters. But no poſſible apology can be made for forging the rude money of more modern times. The crime is certainly greater than that which leads the common coiner to the gallows; inaſmuch as it is committed with more eaſe, and the profit is incomparably larger."

Value.

SECT. VIII. *Of the Value of Medals.*

ALL ancient coins and medals, though equally genuine, are not equally valuable. In medals, as well as in every thing elſe, the ſcarcity of a coin ſtamps a value upon it which cannot otherwiſe be derived from its intrinſic worth. There are four or five degrees of rarity reckoned up; the higheſt of which is called *unique*. The cauſe is generally aſcribed to the fewneſs of number thrown off originally, or to their having been called in, and recoined in another form. To the former cauſe Mr Pinkerton aſcribes the ſcarcity of the copper of Otho and the gold of Peſcennius Niger; to the latter that of the coinage of Caligula: "though this laſt (ſays he) is not of ſingular rarity; which ſhows that even the power of the Roman ſenate could not annihilate an eſtabliſhed money; and that the firſt cauſe of rarity, ariſing from the ſmall quantity originally ſtruck, ought to be regarded as the principal."

In the ancient cities Mr Pinkerton aſcribes the ſcarcity of coin to the poverty or ſmallneſs of the ſtate; but the ſcarcity of ancient regal and imperial coins ariſes principally from the ſhortneſs of the reign; and ſometimes from the ſuperabundance of money before, which rendered it almoſt unneceſſary to coin any money during the reign of the prince. An example of this we have in the ſcarcity of the ſhillings of George III. which ſhows that ſhortneſs of reign does not always occaſion a ſcarcity of coin; and thus the coins of Harold II. who did not reign a year, are very numerous, while thoſe of Richard I. who reigned ten, are almoſt unique. 94 Cauſes of the ſcarcity of medals in ancient cities.

Sometimes the rareſt coins loſe their value, and become common. This our author aſcribes to the high price given for them, which tempts the poſſeſſors to bring them to market; but chiefly to the diſcovering of hoards of them. The former cauſe took place with Queen Anne's farthings, ſome of which formerly ſold at five guineas; nay, if we could believe the newſpapers, Value. pers, one of them was some years ago sold for 960l. the latter with the coins of Canute, the Danish king of England; which were very rare till a hoard of them was discovered in the Orkneys.

[94] Rare coins sometimes become common, and vice versa. As discoveries of this kind, however, produce a temporary plenty, so when they are dispersed the former scarcity returns; while on the other hand some of the common coins become rare through the mere circumstance of neglect.

95 Silver coins in what cases most esteemed. As double the number of copper-coins of Greek cities are to be met with that there are of silver, the latter are of consequence much more esteemed: but the reverse is the case with those of the Greek princes. All the Greek civic coins of silver are very rare excepting those of Athens, Corinth, Messana, Dyrrhachium, Massilia, Syracuse, and some others. Of the Greek monarchic coins, the most rare are the tetradrachms of the kings of Syria, the Ptolemies, the sovereigns of Macedon and Bithynia, excepting those of Alexander the Great and Lysimachus. Those of the kings of Cappadocia are of a small size, and scarce to be met with. Of those of Numidia and Mauritania, the coins of Juba the father are common; but those of the son and nephew Ptolemy scarce. Coins of the kings of Sicily, Parthia, and Judæa, are rare; the last very much so. We meet with no coins of the kings of Arabia and Comagene except in brass: those of the kings of Bosphorus are in electrum, and a few in brass, but all of them rare; as are likewise those of Philetenis king of Pergamus and of the kings of Pontus. In the year 1777, a coin of Mithridates sold for L. 26, 5s. Didrachms of all kings and cities are scarce excepting those of Corinth and her colonies; but the gold coins of Philip of Macedon, Alexander the Great, and Lysimachus, as has already been observed, are common. The silver tetradrachms of all kings bear a very high price. The didrachm of Alexander the Great is one of the scarcest of the smaller Greek silver coins; some of the other princes are not uncommon.

96 Greek copper coins. In most cases the copper money of the Greek monarchs is scarce; but that of Hiero I. of Syracuse is uncommonly plenty, as well as that of several of the Ptolemies.

97 Roman consular coins. The most rare of the consular Roman coins are those restored by Trajan: of the others the gold consular coins are the most rare, and the silver the most common; excepting the coin of Brutus with the cap of Liberty already mentioned, with some others. Some of the Roman imperial coins are very scarce, particularly those of Otho in brass; nor indeed does he occur at all on any coin struck at Rome: but the reason of this may with great probability be supposed to have been the shortness of his reign. His portrait upon the brass coins of Egypt and Antioch is very bad; as well as almost all the other imperial coins of Greek cities. The best likeness is on his gold and silver coins; the latter of which are very common. The Greek and Egyptian coins are all of small or middling sizes, and have reverses of various kinds: those of Antioch have Latin legends, as well as most of the other imperial coins of Antioch. They have no other reverse but the SC in a wreath; excepting in one instance or two of the large and middle brass, where the inscriptions are in Greek. Latin coins of Otho in brass, with figures on the reverse, are certainly false; though in the cabinet of D'Ennery at Paris there was an Otho in middle brass restored by Titus, which was esteemed genuine by connoisseurs. Value.

98 Leaden Roman coins. The leaden coins of Rome are very scarce: Most of them are pieces struck or cast on occasion of the saturnalia; others are tickets for festivals and exhibitions, both private and public. The common tickets for theatres were made of lead, as were the *contorniati*; perpetual tickets, like the English silver tickets for the opera. Leaden medallions are also found below the foundations of pillars and other public buildings, in order to perpetuate the memory of the founders. From the time of Augustus also we find that leaden seals were used. The work of Ticorini upon this subject, intitled *Piomli Antiochi*, is much recommended by Mr Pinkerton.

99 Of coins blundered in the mintage. The Roman coins, which have been blundered in the manner formerly mentioned, are very rare, and undeservedly valued by the connoisseurs. The blunders in the legends of these coins, which in all probability are the mere effects of accident, have been so far mistaken by some medallists, that they have given rise to imaginary emperors who never existed. A coin of Faustina, which has on the reverse SOUSTI. S. C. puzzled all the German antiquaries, till at last Klotz gave it the following facetious interpretation: *Sine omni utilitate sectamini tantas ineptias.*

100 Heptarchic coins of England. The heptarchic coins of England are generally rare except those called *stycas*, which are very common, as well as those of Burgred king of Mercia. The coins of Alfred which bear his bust are scarce, and his other money much more so. Those of Hardyknute are so rare, that it was even denied that they had an existence; but Mr Pinkerton informs us, that there are three in the British museum, upon all of which the name HARTHCANUT is quite legible. No English coins of King John are to be met with, tho' there are some Irish ones; and only French coins of Richard I. "Leake (says Mr Pinkerton) made a strange blunder in ascribing coins of different kings with two faces, and otherwise spoiled in the stamping, to this prince; in which, as usual, he has been followed by a misled number."

101 Scottish coins. Coins of Alexander II. of Scotland are rather scarce; but those of Alexander III. are more plentiful. Those of John Baliol are rare, and none of Edward Baliol to be found.

Sect. IX. *Of the Purchase of Medals.*

Medals are to be had at the shops of goldsmiths and silversmiths, with those who deal in curiosities, &c. but in great cities there are professed dealers in them. The best method of purchasing medals, however, is that of buying whole cabinets, which are every year exposed to auction at London. In these the rare medals are sold by themselves; but the common ones are put up in large lots, so that the dealers commonly purchase them. Mr Pinkerton thinks it would be better that medals were sold one by one; because a lot is often valued and purchased for the sake of a single coin; while the others separately would sell for perhaps four times the price of the whole lot. "If any man of common sense and honesty (says Mr Pinkerton)

Purchase.

kerton) were to take up the trade of selling coins in London, he would make a fortune in a short time. This profitable business is now in the hands of one or two dealers, who ruin their own interest by making an elegant study a trade of knavery and imposition. If they buy 300 coins for 10s. they will ask 3s. for one of the worst of them! nay, sell forged coins as true to the ignorant. The simpletons complain of want of business. A knave is always a fool."

102 Price of gold coins of Carthage, &c.

The gold coins of Carthage, Cyrene, and Syracuse, are worth about twice their intrinsic value as metal; but the other gold civic coins from 5l. to 30l. each. The only gold coins of Athens certainly known to exist are two lately procured by the king. One of these remains in possession of his majesty, but the other was given by the queen to Dr Hunter. There was another in the British museum, but suspected not to be genuine. Dr Hunter's coin, then, if sold, would bear the highest price that could be expected for a coin.

103 Of silver coins.

The silver coins of Syracuse, Dyrrhachium, Massilia, Athens, and a few other states, are common; the drachmas and coins of lesser size are worth about five shillings; the didrachms, tetradrachms, &c. from five to ten, according to their size and beauty; the largest, as might naturally be expected, being more valuable than the small ones. The tetradrachms, when of cities whose coins are common, are worth from 7s. 6d. to 1l. 1s. but it is impossible to put a value upon the rare civic coins; ten guineas have been given for a single one.

104 Greek copper coins.

The Greek copper coins are common, and are almost all of that kind called *small brass;* the middle size being scarce, and the largest in the ages prior to the Roman emperors extremely so. The common Greek coins of brass bring from 3d. to 18d. according to their preservation; but when of cities, whose coins are rare, much higher prices are given. "The want of a few cities, however (says Mr Pinkerton), is not thought to injure a collection; as indeed new names are discovered every dozen of years, so that no assortment can be perfect. To this it is owing that the rarity of the Grecian civic coins is not much attended to."

105 Gold coins of Philip and Alexander.

The gold coins of Philip and Alexander the Great being very common, bear but from five to ten shillings above their intrinsic value; but those of the other princes, being rare, sell from 3l. to 30l. each, or even more.

The tetradrachms are the dearest of the silver monarchic money, selling from five to ten shillings; and if very rare, from 3l. to 30l. Half these prices may be obtained for the drachmas, and the other denominations in proportion.

106 Greek copper coins more rare than the silver.

The Greek copper coins are for the most part scarcer than the silver, except the Syro-Grecian, which are common, and almost all of the size called small brass. "They ought (says Mr Pinkerton) to bear a a high price; but the metal and similarity to the copper civic coins, which are common, keep their actual purchase moderate, if the seller is not well instructed, and the buyer able and willing to pay the price of rarity."

The name of weights given to the ancient Roman ases is, according to our author, exceedingly improper; as that people had weights of lead and brass sides, without the least appearance of a portrait upon them. These denote the weight by a certain number of knobs; and have likewise small *fleurettes* engraved upon them. According to Mr Pinkerton, whenever we meet with a piece of metal stamped on both sides with busts and figures, we may lay it down as a certain rule that it is a coin; but when slightly ornamented and marked upon one side only, we may with equal certainty conclude it to be a weight.

107 Price of the ancient Roman ases.

The ancient Roman ases are worth from 2s. to 2l. according to the singularity of their devices. Consular gold coins are worth from 1l to 5l. Pompey with his sons 21l. and the two Bruti 2?l. The silver coins are universally worth from a shilling to half a crown, excepting that of the cap of Liberty and a few others, which if genuine will bring from 10s to 5l. The consular copper bears an equal price with the silver, but is more rare; the consular silver coins restored by Trajan are worth 20s. each.

With regard to the Roman imperial coins, it is to be observed, that some of those which belong to princes whose coins are numerous, may yet be rendered extremely valuable by uncommon reverses. Mr Pinkerton particularly points out that of Augustus, with the legend C. MARIUS TROGVS, which is worth three guineas, though the silver coins of that prince in general are not worth above a shilling. In like manner, the common gold coins of Trajan are not worth above twenty shillings, while those with *Basilica Ulpia, Forum Trajani, Divi Nerva et Trajanus, Pater, Divi Nerva et Platina Aug. Profectio Aug. Regna Assignata, Rex Parthus*, and some others, bear from three to six pounds. The ticket medals belong to the Roman Senate, and are worth from three to ten shillings. The forged coins and medallions of the Paduan sell from one to three shillings each.

108 Barbaric coins.

Of the coins of other nations, those of Hilderic king of the Vandals are in silver, and worth 10s.; the small brass of Athanaric, 5s.; the gold of Theodoric 2l.; the second brass of Theodahat 5s.; the second brass of Baducta rare, and worth 10s.; the third brass, 3s. The British coins are very rare, and worth from ten shillings to two guineas each, sometimes much more. Medals with unknown characters are always scarce and dear. Saxon pennies of the heptarchy are rare, and worth from ten shillings to *ten pounds*, according to their scarcity and preservation. The coins of the English kings are common; those of Edward the Confessor, in particular; others are rare, and worth from ten shillings to two guineas, while two of Hardyknute are worth no less than ten guineas. The gold medals of Henry, in 1545, and the coronation of Edward, are worth 20l. each: the Mary of Trezzo, 3l.; Simon's head of Thurloe in gold is worth 12l.; his oval medal in gold upon Blake's naval victory at sea is worth 30l.; and his trial piece, if brought to a sale, would, in Mr Pinkerton's opinion, bring a still higher price. The medals of Queen Anne, which are intrinsically worth about two guineas and a half, sell for about 3l. each; the silver, of the size of a crown piece, sell for 10s. and the copper from five to ten shillings. Dassier's copper pieces sell from two to five shillings, and a few bear a higher price.

The Scottish gold coins sell higher than the English,

Arrangement, &c.

liſh, but the others are on a par. The ſhilling of Mary with the buſt is rare, and ſells for no leſs than 30 l.; the half 3 l.; and the royal 5 l. 5 s. The

109 Gold coins of Scotland

French teſtoon of Francis and Mary brings 10 l. 10 s. and the Scottiſh one of Mary and Henry would bring 50 l. as would alſo the medal of James IV. The coronation medal of Francis and Mary is worth 20 l. Briot's coronation medal ſold in 1755 only for two guineas at Dr Mead's ſale; but would now bring 20 l. if ſold according to rarity.

110 Engliſh coins ſtruck in Ireland.

The Engliſh coins ſtruck in Ireland are of much the ſame price with thoſe of the native country; but the St Patrick's halfpence and farthings are rather ſcarce, and the rare crown of white metal is worth 4 l. The gun-money of James II. and all other Iriſh coins are very common.

Sect. X. *Arrangement of Medals, with the Inſtruction to be derived from them.*

Having thus given a full account of every thing in general relative to medals, we muſt now come to ſome particulars reſpecting their arrangement, and the entertainment which a medalliſt may expect from the trouble and expence he is at in making a collection.

It has already been obſerved, that one of the principal uſes of medals is the elucidation of ancient hiſtory. Hence the arrangement of his medals is the firſt thing that muſt occur in the formation of a cabinet. The moſt ancient medals with which we are acquainted are thoſe of Alexander I. of Macedon, who began to reign about 501 years before Chriſt. The ſeries ought of conſequence to begin with him, and to be ſucceeded by the medals of Sicily, Caria, Cyprus, Heraclia, and Pontus. Then follow Egypt, Syria, the Cimmerian Boſphorus, Thrace, Bithynia, Parthia, Armenia, Damaſcus, Cappadocia, Paphlagonia, Pergamus, Galatia, Cilicia, Sparta, Pæonia, Epirus, Illyricum, Gaul, and the Alps, including the ſpace of time from Alexander the Great to the birth of Chriſt, and which is to be accounted the third medallic ſeries of ancient monarchs. The laſt ſeries goes down to the fourth century, including ſome of the monarchs of Thrace, Boſphorus, and Parthia, with thoſe of Comagene, Edeſſa or Oſrhoene, Mauritania, and Judæa. A moſt diſtinct ſeries is formed by the Roman emperors, from Julius Cæſar to the deſtruction of Rome by the Goths; nay for a much longer period, were it not that towards the latter part of it the coins become ſo barbarous as to deſtroy the beauty of the collection. Many ſeries may be formed of modern potentates.

By means of medals we can with great certainty determine the various ornaments worn by ancient

111 Diadem an ancient emblem of ſovereign authority.

princes as badges of diſtinction. The Grecian kings have generally the diadem, without any other ornament; and though in general the ſide of the face is preſented to view, yet in ſome very ancient Greek and Roman conſular coins, full faces of excellent workmanſhip are met with. On ſeveral coins alſo two or three faces are to be ſeen, and theſe are always accounted very valuable.

The diadem, which was no more than a ribbon tied round the head with a floating knot behind, adorns all the Grecian princes from firſt to laſt, and is almoſt an infallible mark of ſovereign power. In the Roman conſular coins it is ſeen in conjunction with Numa and Ancus, but never afterwards till the time of Licinius, the colleague of Conſtantine. Diocleſian, indeed, according to Mr Gibbon, firſt wore the diadem, but his portrait upon coins is never adorned with it. So great an averſion had the Romans to kingly power, that they rather allowed their emperors to aſſume the radiated crown, the ſymbol of divinity, than to wear a diadem; but after the time of Conſtantine it becomes common. The radiated crown appears firſt on the poſthumous coins of Auguſtus as a mark of deification, but in ſomewhat more than a century became common.

The laurel crown, at firſt a badge of conqueſt, was afterwards permitted by the ſenate to be worn by Julius Cæſar, in order to hide the baldneſs of his head. From him all the emperors appear with it on their medals, even to our own times. In the lower empire the crown is ſometimes held by a hand above the head, as a mark of piety. Beſides theſe, the naval, mural, and civic crowns, appear on the medals both of emperors and other eminent men, to denote their great actions. The laurel crown is alſo ſometimes worn by the Greek princes. The Arſacidæ of Parthia wear a kind of ſaſh round the head, with their hair in rows of curls like a wig. The Armenian kings have the *tiara*, a kind of cap which was eſteemed the badge of imperial power in the eaſt. Conical caps are ſeen on the medals of Xerxes, a petty prince of Armenia, and Juba the father, the former having a diadem around it.

112 Symbols of deity on the coins of Alexander and his ſucceſſors.

The impious vanity of Alexander and his ſucceſſors in aſſuming divine honours is manifeſt on their medals, where various ſymbols of divinity are met with. Some of them have an horn behind their ear, either to denote their ſtrength, or that they were the ſucceſſors of Alexander, to whom this badge might be applied as the ſon of Jupiter Ammon. This, however, Mr Pinkerton obſerves, is the only one of theſe ſymbols which certainly denotes an earthly ſovereign, it being doubted whether the reſt are not all figures of gods.—According to Eckhet, even the horn and diadem belong to Bacchus, who invented the latter to cure his headachs; and, according to the ſame author, the only monarch who appears on coins with the horn is Lyſimachus. We are informed, however, by Plutarch, that Pyrrhus had a creſt of goats horns to his helmet; and the goat we know was a ſymbol of Macedon. Perhaps the ſucceſſors of Alexander wore this badge of the horn in conſequence. The helmet likewiſe frequently appears on the heads of ſovereigns, and Conſtantine I. has helmets of various forms curiouſly ornamented.

The diadem is worn by moſt of the Greek queens, by Orodaltis, daughter of Lycomedes, king of Bithynia; and though the Roman empreſſes never appear with it, yet this is more than compenſated by the variety of their head-dreſſes. Sometimes the buſt of an empreſs is ſupported by a creſcent, to imply that ſhe was the moon as her huſband was the ſun of the ſtate. The toga, or veil drawn over the face, at firſt implied that the perſon was inveſted with the pontifical office; and accordingly we find it on the buſts of Julius Cæſar, while Pontifex Maximus. It likewiſe implies the au-

guſtſhip,

Arrangement, &c. gurship, the augurs having a particular kind of gown called *lana*, with which they covered their heads when observing an omen. In latter times this implies only consecration, and is common in coins of empresses. It is first met with on the coins of Claudius Gothicus as the mark of consecration of an emperor. The *nimbus*, or glory, now appropriated to saints, has been already mentioned. It is as ancient as Augustus, but is not to be met with on many of the imperial medals, even after it began to be appropriated to them. There is a curious coin, which has upon the reverse of the common piece with the head of Rome Urbs Roma, in large brass, Constantine I. sitting amid victories and genii, with a triple crown upon his head for Europe, Asia, and Africa, with the legend Securitas Romæ.

113 Portraits upon medals.

In general only the bust is given upon medals, though sometimes half the body or more; in which latter case the hands often appear with ensigns of majesty in them; such as the globe said to have been introduced by Augustus as a symbol of universal dominion; the sceptre sometimes confounded with the consular staff, a roll of parchment, the symbol of legislative power, and an handkerchief expressive of the power over the public games, where the emperor gave the signal. Some princes hold a thunderbolt, showing that their power on earth was equal to that of Jupiter in Heaven; while others hold an image of Victory.

Medals likewise afford a good number of portraits of illustrious men; but they cannot easily be arranged in chronological order, so that a series of them is not to be expected. It is likewise vain to attempt the formation of a series of gods and goddesses to be found on ancient coins. Mr Pinkerton thinks it much better to arrange them under the several cities or kings whose names they bear. A collection of the portraits of illustrious men may likewise be formed from medals of modern date.

114 Reverses of Greek and Roman coins.

The reverses of ancient Greek and Roman coins afford an infinite variety of instruction and amusement. They contain figures of deities at full length, with their attributes and symbols, public symbols and diversions, plants, animals, &c. &c. and in short almost every object of nature or art. Some have the portrait of the queen, son, or daughter of the prince whose image appears on the face or obverse; and these are esteemed highly by antiquaries, not only because every coin stamped with portraits on both sides is accounted valuable, but because they render it certain that the person represented on the reverse was the wife, son, or daughter of him who appears on the obverse; by which means they assist greatly in the adjusting of a series. Some, however, with two portraits are common, as Augustus, the reverse of Caligula; and Marcus Aurelius, reverse of Antoninus Pius.

We find more art and design in the reverses of the Roman medals than of the Greek: but, on the other hand, the latter have more exquisite relief and workmanship. The very ancient coins have no reverses, excepting a rude mark struck into the metal resembling that of an instrument with four blunt points on which the coin was struck; and was owing to its having been fixed by such an instrument on that side to receive the impression upon the other. To this succeeds the image of a dolphin, or some small animal, in one of the departments of the rude mark, or in an hollow square: and this again is succeeded by a more perfect image, without any mark of the hollow square. Some of the Greek coins are hollow in the reverse, as those of Caulonia, Crotona, Metapontum, and some other ancient cities of Magna Grecia. About 500 B. C. perfect reverses appear on the Greek coins, of exquisite relief and workmanship. "The very muscles of men and animals (says Mr Pinkerton) are seen, and will bear inspection with the largest magnifier as ancient gems. The ancients certainly had not eyes different from ours; and it is clear that they must have magnified objects. A drop of water forms a microscope; and it is probable this was the only one of the ancients. To Greek artists we are indebted for the beauty of the Roman imperial coins; and these are so highly finished, that on some reverses, as that of Nero's decursion, the *adventus* and *progressio* of various emperors, the *fundator pacis* of Severus, the features of the emperor, riding or walking, are as exact as on the obverse. But though the best Greek artists were called to Rome, yet the Greek coins under the Roman emperors are sometimes well executed, and always full of variety and curiosity. No Roman or Etruscan coins have been found of the globular form, or indented on the reverse like the early Greek. The first Greek are small pieces of silver, while the Roman are large masses of copper. The former are struck; the latter cast in moulds. The reverses of the Roman coins are very uniform, the prow of a ship, a car, or the like, till about the year 100 B. C. when various reverses appear on their consular coins in all metals. The variety and beauty of the Roman imperial reverses are well known. The medallist much values those which have a number of figures; as the *Puellæ Faustinianæ*, of Faustina, a gold coin no larger than a sixpence, which has 12 figures; that of Trajan, *regna assignata*, has four; the *congiarium* of Nerva five; the allocution of Trajan seven; of Hadrian 10; of Probus 12. Some Roman medals have small figures on both sides, as the *Apolloni sancto* of Julian II. Such have not received any peculiar name among the medallists. Others have only a reverse, as the noted *spintriati*, which have numerals I. II. &c. on the obverse."

115 Of the deities represented upon ancient coins.

The *names* of the deities represented on the reverses of Greek coins are never expressed; perhaps, as Mr Pinkerton supposes, out of piety, a symbolical representation of their attributes being all that they thought proper to delineate; but the Roman coins always express the name, frequently with an adjunct, as Veneri Victrici, &c. In others, the name of the emperor or empress is added; as Pudicitiæ Augustæ, round an image of Modesty; Virtus Augusti, a legend for an image of Virtue.

The principal symbols of the divine attributes to be met with on the Greek medals are as follow:

1. Jupiter is known on the coins of Alexander the Great by his eagle and thunderbolts; but when the figure occurs only on the obverses of coins, he is distinguished by a laurel crown, and placid bearded countenance. Jupiter Ammon is known by the ram's-horn twisting round his ear; a symbol of power and strength, assumed by some of the successors of Alexander the Great, particularly by Lysimachus.

2 Nep-

Arrangement, &c.

2. Neptune is known by his trident, dolphin, or being drawn by sea-horses; but he is seldom met with on the Grecian coins.

3. Apollo is distinguished by an harp, branch of laurel, or tripod; and sometimes by a bow and arrows. In the character of the Sun, his head is surrounded with rays; but when the bust only occurs, he has a fair young face, and is crowned with laurel. He is frequent on the coins of the Syrian princes.

4. Mars is distinguished by his armour, and sometimes by a trophy on his shoulders. His head is armed with a helmet, and has a ferocious countenance.

5. Mercury is represented as a youth, with a small cap on his head, wings behind his ears and on his feet. He is known by the cap, which resembles a small hat, and the wings. He appears also with the caduceus, or wand twined with serpents, and the *marsupium*, or purse, which he holds in his hand.

6. Æsculapius is known by his bushy beard, and his leaning on a club with a serpent twisted round it. He sometimes occurs with his wife Hygeia or Health, with their son *Telesphorus* or Convalescence between them.

7. Bacchus is known by his crown of ivy or vine, his diadem and horn, with a tiger and satyrs around him.

8. The figure of Hercules is common on the coins of Alexander the Great, and has frequently been mistaken for that of the prince himself. He appears sometimes as a youth and sometimes with a beard. He is known by the club, lion's skin, and remarkable apparent strength; sometimes he has a cup in his hand, and a poplar tree, as a symbol of vigour, is sometimes added to the portrait.

9. The Egyptian Serapis is known by his bushy beard, and a measure upon his head.

10. Apis is delineated in the form of a bull, with a flower of the lotos, the water-lily of the Nile, supposed by Macrobius to be a symbol of creation; and Jamblichus tells us, that Osiris was thought to have his throne in it.

11. Harpocrates, the god of Silence, appears with his finger on his mouth; sometimes with the sistrum in his left hand; a symbol common to most of the Egyptian deities.

12. Canopus, another Egyptian deity, appears in the shape of an human head placed on a kind of pitcher. "This deified pitcher (says Mr Pinkerton) seems to refer to an anecdote of ancient superstition, which, I believe, is recorded by Plutarch. It seems some Persian and Egyptian priests had a contest which of their deities had the superiority. The Egyptian said, that a single vase, sacred to Serapis, would extinguish the whole power of the Persian deity of fire. The experiment was tried; and the wily Egyptian, boring holes in the vase and stopping them with wax, afterwards filled the vase with water; which, gushing through the holes as the wax melted, extinguished the Persian deity. Hence the vase was deified."

13. The *Holy Senate* and *Holy People*, appear frequently on Greek imperial coins, sometimes represented as old men with beards, at others as youths.

The goddesses represented on medals are,

1. Juno, represented by a beautiful young woman, sometimes with a diadem, sometimes without any badge, which is reckoned a sufficient distinction, as the other goddesses all wear badges. Sometimes she appears as the goddess of marriage; and is then veiled to the middle and sometimes to the toes. She is known by the peacock, a bird sacred to her from the fable of Argus.

2. Minerva is very common on the coins of Alexander the Great; and her bust has been mistaken by the celebrated painter Le Brun for the hero himself. She is very easily distinguished by the helmet. Her symbols are, her armour; the spear in her right hand, and the ægis, with a Medusa's head, in her left; an owl commonly standing by her.

3. Diana of Ephesus is commonly represented on the Greek imperial coins; and appears with a great number of breasts, supposed to denote universal Nature. She is supported by two deer, and carries a pannier of fruit upon her head. The bust of this goddess is known by the crescent on her brow, and sometimes by the bow and quiver at her side.

4. Venus is known by an apple, the prize of beauty, in her hand. Sometimes she is distinguished only by her total want of dress; but is always to be known by her extraordinary beauty, and is sometimes adorned with pearls about the neck.

5. Cupid is sometimes met with on the Syrian coins, and is known by his infancy and wings.

6. Cybele is known by a turreted crown and lion; or is seen in a chariot drawn by lions.

7. Ceres is known by her garland of wheat, and is common on the Sicilian coins; that island being remarkable for its fertility. Sometimes she has two serpents by her, and is sometimes drawn in a chariot by them. She carries in her hands the torches with which she is fabled to have gone in search of her daughter Proserpine.

8. Proserpine herself is sometimes met with on coins with the name of κορη or the *girl*.

9. The Egyptian Isis has a bud or flower on her head; a symbol of the perpetual bloom of the inhabitants of heaven. She carries also a sistrum in her hand.

10. The Sidonian Astarte appears on a globe supported on a chariot with two wheels, and drawn by two horses.

These are the deities most commonly represented on the Greek coins. The more uncommon are, Saturn with his scythe, or with a hook on the Heraclian coins; Vulcan with his tongs, on the reverse of a coin of Thyatira, represented at work in the presence of Minerva. Adranus, a Sicilian god, is sometimes represented on coins with a dog. Anubis, an Egyptian deity, has a dog's head. Atis is known by his Phrygian bonnet; Castor and Pollux by a star on the head of each; Dis, by his old face, dishevelled hair and beard, and a hook; Flora by her crown of flowers; Nemesis by her wheel; and Pan by his horns and ears belonging to some kind of beast.

116 Table of Symbols.

There are likewise to be found on medals many different symbols by themselves; of the most remarkable of which we shall give the following table, with their significations:

Symbols.	Signification.
1. Vases with sprigs,	Solemn games.

2. Small

Arrangement, &c.

Symbols.	Signification.
2. Small cheſt or hamper, with a ſerpent leaping out,	Myſtic rites of Bacchus.
3. Anchor on Seleucian medals,	Coin ſtruck at Antioch, where an anchor was dug up.
4. Apollo on Syrian coins, on an inverted hamper.	Covered tripod.
5. Bee, - -	Ariſteus the ſon of Apollo.
6. Laurel, - -	Apollo.
7. Reed, - -	A river.
8. Ivy and grapes, - -	Bacchus.
9. Poppy, - -	Ceres and Proſerpine.
10. Corn, - - -	Ceres.
11. Owl and olive, - -	Minerva.
12. Dove, - - -	Venus.
13. Torch, - -	Diana, Ceres, or Proſerpine.
14. Mudnis, or conic ſtone,	The ſun, Belus, or Venus.

Symbols of Countries, &c.

15. Pomegranate flowers, -	Rhodes.
16. Owl, - - -	Athens.
17. Pegaſus, - -	Corinth.
18. Wolf's head, -	Argos.
19. Bull's head, - -	Bœotia.
20. Minotaur's head and labyrinth,	Crete.
21. Horſe's head, -	Pharſalia.
22. Lion, - -	Marſeilles.
23. Tortoiſe, - -	Peloponneſus.
24. Sphinx, - -	Scio.
25. Three legs joined, as in the Iſle of Man-money,	Sicily.
26. Horſe, - -	Theſſaly.
27. The creſcent, -	Byzantium (A).
28. Bull, - -	Suppoſed to be a river.
29. Enſign, with the letters COL.	A colony drawn from one legion.
30. Bull, - -	Apis, ſtrength or ſecurity.
31. Caduceus, - -	Peace and concord.
32. Cornucopia, -	Abundance.
33. Pontifical hat, -	Prieſthood.
34. Parazonium, - -	Baton of command.

Symbols.	Signification.
35. Globe on an altar with three ſtars. - - -	The world preſerved by the gods for the three ſons of Conſtantine I.
36. Fort and gate, - -	Security.
37. Tribuli, a kind of Chevaux de Frize, - -	Unknown.
38. Altar or tripod, -	Piety.
39. Dolphin, - -	Apollo.
40. Lectiſternia, - -	Feſtivals.
41. Lituus, or twiſted wand, -	Augurſhip.
42. Apex, or cap with ſtrings,	Pontificate.
43. Thenſa, or chariot employed to carry images, - -	Conſecration of an empreſs.
44. Peacock, - -	Ditto.
45. Eagle, - -	Conſecration of an emperor.

117 Legends of Medals. The legends put upon medals are deſigned as explanations of them; but as the compaſs of even the largeſt coins does not admit of any great length of inſcription, it has always been found neceſſary to uſe abbreviations; and in readily decyphering theſe lies a conſiderable part of the difficulty of the ſcience. This, however, is greater in the Roman than in the Greek medals; for the Greeks commonly inſert as much of the word as is ſufficient to enable us eaſily to underſtand its meaning; but it is common for thoſe who attempt to explain letters that do not often occur, to fall into very ridiculous errors. Of this Mr Pinkerton gives a moſt remarkable inſtance in Fortunius Licetus, a learned man, who finding upon a coin of Adrian the letters L. ΙΔ. ſignifying the 14th year of that emperor's reign, imagined that they ſignified *Lucernas invenit Delta*; "Delta invented lanthorns;" and thence aſcribed the origin of lanthorns to the Egyptians. Tables explaining the meaning of the abbreviations found upon medals have been publiſhed by Patin, Urſatus, and others.

118 Extraordinary miſtake of Fortunius Licetus.

Sect. XI. *Of Medallions, Medalets, &c.*

Besides the ordinary coins of the ancients, which paſſed in common circulation through the country, there were others of a larger ſize, which are now termed *medallions*. Theſe were ſtruck on the commencement of the reign of a new emperor and other ſolemn occaſions: frequently alſo, by the Greeks in particular, as monuments of gratitude or of flattery. Sometimes they were mere trial or pattern pieces; and thoſe abound after the time of Maximian with the words *Tres Monetæ* on the reverſe. The common opinion is,

(A) This appears on the early coins of Byzantium, with the legend ΒΥΖΑΝΤΙΝ ΣΩΤ. "the preſerver of Byzantium." The reaſon of this was, that when Philip of Macedon beſieged the city, and was about to ſtorm it in a cloudy night, the moon ſhone out on a ſudden and diſcovered him; by which means the inhabitants had time to collect their forces and repulſe him. The Turks, on entering Conſtantinople, found this badge in many places; and ſuſpecting ſome magical power in it, aſſumed the ſymbol and its power to themſelves; ſo that the creſcent is now the chief Turkiſh enſign.

Medallions, &c. is, that all the Roman pieces of gold exceeding the denarius aureus, all in silver exceeding the denarius, and all in brass exceeding the sestertius, went under the denomination of *medallions:* but Mr Pinkerton thinks that many of these large pieces went in circulation, tho' not very commonly, as our five and two guinea pieces, silver crowns, &c. do in this country. The finest medallions were presented by the mint-masters to the emperor, and by the emperor to his friends, as specimens of fine workmanship. The best we have at present are of brass, and many of them composed of two sorts of metal; the centre being copper, with a ring of brass around it, or the contrary; and the inscription is sometimes confined to one of the metals, sometimes not. There is a remarkable difference between the Greek and Roman medallions in point of thickness; the latter being frequently three or four lines thick, while the other seldom exceed one. Very few medallions, however, were struck by the Greeks before the time of the Roman emperors; but the Greek medallions of the emperors are more numerous than those of the Romans themselves. All these pieces, however, are of such high price that few private persons are able to purchase them. In the last century Christina queen of Sweden procured about 300. In the king of France's collection there are 1200; a number formerly supposed not to exist; and Dr Hunter's collection contains about 400, exclusive of the Egyptian.

Besides these large pieces, there are smaller ones of a size somewhat larger than our half-crowns; and by Italian medallists are called *medaglion cini*, or small medallions. They are still scarcer than the large kind.

119 Of medalets. There is still a third kind, which have almost escaped the notice of medallists, viz. the small coins or *missilia* scattered among the people on solemn occasions; such as those struck for the slaves on account of the saturnalia; counters for gaming; tickets for baths and feasts; tokens in copper and in lead; &c. These are distinguished by Mr Pinkerton by the name of *medalets*. Many, or perhaps almost all, of those struck for the saturnalia were satyrical; as the slaves had then a licence to ridicule not only their masters but any person whatever. Mr Pinkerton mentions one of the most common pieces of this kind, which has on the obverse the head of an old woman veiled, with a laurel crown; the reverse only S. C. within a wreath. Baudelot is of opinion that it is the head of Acca Laurentia, the nurse of Romulus, to whom a festival was ordained. "Perhaps (says Mr Pinkerton), it was struck in ridicule of Julius Cæsar; for the manner of the laurel crown, and its high appearance over the head, perfectly resemble that of Julius on his coins." Some have a ship upon one side; on the reverse Ŧ, or a cross, which was the image of Priapus; and occasioned many false invectives against the first Christians, who paid such respect to the cross. Some pieces have the heads of the emperors upon one side; on the reverse only numerals III. IV. V. &c. and the noted *spintriati* of Tacitus. Both these kinds appear tickets for the baths, as the number seems to denote the particular bath. Some have the head of a girl, with a vessel used at the baths in her hand. The spintriati are so immodest, that few will bear mention. But some are merely ludicrous; as one which has an ass with a bell about his neck, and a soldier riding him; another with two figures hoisting a woman in a basket into the air. Of those that will just bear mention, is a man with titles around him, as chief of the games; and a woman in ridicule of the modest bath-girl above-mentioned. There is also one marked XIX, on which appears an imperator triumphing in a car: this car is placed on the back of a camel; and behind the imperator is a monkey mimicking him.

120 Of the contorniati. A fourth class of medals are called *contorniati* from the Italian *contorniato*, "encircled;" because of the hollow circle which commonly runs around them. They are distinguished from medallions by their thinness, faint relief, reverses sometimes in relief, sometimes hollow; and in general by the inferiority in their workmanship. The opinions of medallists concerning these pieces are very various; some suppose them to have been struck by Gallienus to the memory of illustrious men and celebrated *athletæ*, at the time that he caused all the consecration coins of his predecessors to be restored; others ascribe their invention to Greece, &c. but Mr Pinkerton is of opinion that they were only tickets for places at public games. Many of them, notwithstanding their inferior workmanship, are very valuable on account of their preserving the portraits of some illustrious authors of antiquity no where else to be found. Much dependance, however, cannot be put on the portraits of Greek authors and eminent men found upon some of them; for though we know that the busts of Sallust, Horace, &c. must have been struck when their persons were fresh in the memory of the artists, yet it was otherwise with Homer, Solon, Pythagoras, &c. which are to be found on some of them. Even these, however, are valuable, as being ancient and perhaps traditional portraits of these great men. The last whose portraits are supposed to have been delineated in this way, are Apollonius Tyaneus who flourished in the time of Domitian, and Apuleius in that of Marcus Antoninus. Mr Pinkerton thinks it a confirmation of his opinion concerning these medals, that the reverses always contain some device alluding to public games, as that of a charioteer driving a chariot, &c.

Sect. XII. *Directions for making Cabinets.*

We must now proceed to the last part of our subject, viz. that of giving directions for the formation of cabinets. As we have already seen that the formation of any one must be attended with very considerable expence, it is necessary for every one who attempts this to proportion the cabinet to his own circumstances. There are, properly speaking, three kinds of cabinets. I. Those meant to contain a coin of every sort that has been issued from the mint in every age and country; but this, which may be called the large and complete cabinet, is not to be purchased by private persons. That of Dr Hunter already mentioned is perhaps one of the best private cabinets ever known; and cost 23,000l. but as many duplicates were sold as cost 2000l. by which means the expence was reduced to 21,000. The vast collection made by the king of France cost upwards of 100,000l. The smaller

Directions for making cabinets.

smaller cabinet may be supposed to consist only of middle and small Roman brass, English pennies, groats, &c. with a few medals of the more valuable kind, and may be supposed to incur an expence of from 200 to 1000l. The smallest kind is called a *casket* of medals, and does not consist of above a thousand at most of various kinds; and consequently the expence must depend on the pleasure of the proprietor.

In the formation of the grand cabinet, it must be observed that the Greek medals of every denomination do not admit of any arrangement by the metals like the Roman; not any regular series of this kind being met with even in the most opulent cabinets. Hence in all collections the civic coins are ranged according to an alphabetical order; and the monarchic in a chronological one. The same rule is to be observed in the Roman consular medals; they are ranged, like the coins of the Greek cities, in an alphabetical series of the families. The Roman imperial coins are only those capable of being arranged according to sizes and metals. Even from this must be excepted the minimi, or very smallest coins; which are so scarce, that the only regular series of them in the world is that belonging to the king of Spain, which was formed by a most skilful French medallist, and consists of all the metals. The arrangement of a grand cabinet, according to Mr Pinkerton, is as follows.

" I. The coins of cities and of free states in alphabetical order: whether using Greek, Roman, Punic, Etruscan, or Spanish characters.

" II. Kings in chronological series, both as to foundation of empire and seniority of reign.

" III. Heroes, heroines, founders of empires, and cities.

" IV. Other illustrious persons.

" V. Roman ases.

" VI. Coins of families, commonly called consular.

" VII. Imperial medallions.

" VIII. Imperial gold.

" IX. Imperial *minimi* of all metals.

" X. Imperial silver.

" XI. Imperial first brass.

" XII. Second brass.

" XIII. Third brass.

" XIV. Colonial coins, which are all of brass.

" XV. Greek cities under the emperors, of all metals and sizes. In a smaller cabinet they may be put with the Roman, according to their metal and size. Those without the emperor's head go to class I. tho' struck in Roman times.

" XVI. Egyptian coins struck under the Roman emperors, of all metals and sizes. They are mostly of a base metal called by the French *patin*; it is a kind of pot metal or brittle brass.

" XVII. Contorniati, or ticket medals.

" XVIII. Coins of Gothic princes, &c. inscribed with Roman characters.

" XIX. Coins of southern nations using uncommon alphabets; as the Persian, Punic, Etruscan, and Spanish.

" XX. Coins of northern nations using uncommon characters, as the Punic and German.

" In the modern part no series can be formed of copper that will go back above two centuries; but sequences (chronological series) of gold and silver may be arranged of all the different empires, kingdoms, and states, as far as their several coinages will allow. Those of England and France will be the most perfect. Modern silver is commonly arranged in three sequences; the dollar, the groat, and the penny sizes. The medals of each modern country ought of course to be separated; though it is best to arrange each set in chronological order, let their size of metal be what they will. It may be remarked here, that our modern medals, of the size of a tea-saucer, are only so many monuments of barbarism. The ancient medallions are almost universally but little larger than our crown-piece, though three or four of them may extend to about two inches diameter, but very many modern medals to four inches and more. A large medal always declares an ignorant prince or an ignorant artist. Into the size of a crown-piece the ancients threw more miracles in this way than will ever appear in these monstrous productions."

These directions will likewise apply to the formation of a cabinet of the second kind: but if the collector means to form a series of large Roman brass, he will find the coins of four or five emperors so scarce as not to be attainable in that series, even at any price. He must therefore supply their places with middle brass, as is allowed with regard to Otho; even in the best cabinets, there not being above three coins of that emperor in large brass known in the world; whereas of the middle brass, two or three hundred may exist. For this reason Mr Pinkerton concludes, that in cabinets of the second class, the collector may mingle the large and second brass together as he thinks proper, in order to save expence; though it would not do so well to unite such disproportionate sizes as the large and small. " In the small sequence, however (says he), there can be no harm in his mixing gold, silver, and brass, as chance or curiosity may lead him to purchase any of these metals. And tho' your starched bigotted medallist may sneer because such a sequence would controvert his formal and narrow way of thinking, common sense will authorise us to laugh at the pedant in our turn, and to pronounce such a series more various, rich, and interesting, than if the collector had arranged only one metal, and rejected a curious article because he did not collect gold or silver. In like manner, if, in the modern part of the smaller cabinet, any coin of a series is of high price, or of bad impression, there can be no impropriety in putting another of the same reign, which is cheaper, or better executed, though of a different denomination or of a little larger size. In short, the collector has no rules but in the Greek cities and Roman families, to observe alphabetical order and chronology in every thing else.

Tables of Ancient Coins.

The most ancient coins, according to Froelich, are distinguished by the following marks, which he accounts infallible. 1. Their oval circumference, and globulous swelling shape. 2. Antiquity of alphabet. 3. The characters being retrograde, or the first division of the legend in the common style, while the next is retrograde. 4. The indented square already described. 5. The simple structure of the mintage. 6. Some of

Ancient Coins.

of the very old coins are hollowed on the reverſe, with the image impreſſed on the front. 7. The dreſs, ſymbols, &c. frequently of the rudeſt deſign and execution.

Table I. *Ancient Greek Coins.*

1. Thoſe without impreſſion.

2. With one or more hollow indented marks on one ſide, and an impreſſion in relief on the other.—Of Chalcedon on the Helleſpont, Leſbos, Abdera in Thrace, Acanthus in Macedon, thoſe ſaid to belong to Egium in Achaia. This claſs continues from about 900 to 700 B. C.

3. With an indented ſquare divided into ſegments, having a ſmall figure in one of them; the reſt blank, with a figure in relief on the obverſe.—Of Syracuſe and other places adjacent.—Continue from 700 to 600 B. C.

4. Coins hollow on the reverſe, with figures in relief on the obverſe.—Of Caulonia, Crotona, Metapontum, &c. Suppoſed by ſome to be a local coinage of Magna Græcia; but probably of equal antiquity with the former.

5. Coins in which a ſquare dye is uſed on one or both ſides.—Of Athens, Cyrene, Argos, &c.—Of Alexander I. and Archelaus I. of Macedon. Diſuſed in the reign of the latter about 420 B. C.

6. Complete coins, both in obverſe and reverſe, occur firſt in Sicily in the time of Gelo, about 491 B. C.

7. Coins of Alexander the Great and his ſucceſſors. About the time of this hero the Greek coins began to attain to perfection, and were ſtruck of uncommon beauty. It is remarkable, that on the coins of this monarch his own image ſeldom occurs. The only one yet found of Alexander with his portrait upon it, and ſtruck during his reign, is a ſilver hemidrachm in Dr Hunter's cabinet, which is repreſented Plate CCXCII. n° 3. After his death many coins bear his portrait. Trebellius Pollio informs us, that ſome coins, particularly thoſe of Alexander, uſed to be worn as amulets; and many medals are met with in cabinets bored ſeemingly with that intention.

8. Coins of the ſucceſſors of Alexander.—Thoſe of the Syrian monarchs almoſt equal the coins of Alexander himſelf in beauty. Thoſe of Antiochus VI. are ſuppoſed to be the moſt perfect patterns of male beauty to be met with any where. The Egyptian Ptolemies are ſomewhat inferior.

9. The coins of the Arſacidæ of Parthia done by Greek workmen.

10. The Greek imperial coins, being ſuch as have the head of an emperor or empreſs; ſuch as have not theſe impreſſions being claſſed with the civic coins, though ſtruck under the Roman power. None of the imperial coins occur in gold. Of ſilver there are thoſe of Antioch, Tyre, Sidon, Tarſus, Berytus, Cæſarea. Egyptian ſilver coins of baſe metal. Syrian ſilver coins, which ſometimes bear on the reverſe the club of Hercules, or the Tyrian ſhell-fiſh. Thoſe of Sidon bear the image of the goddeſs Aſtarte, or her chariot. Thoſe of Cæſarea in Cappadocia of better work than the Syrian. Lycian coins of good workmanſhip: on the reverſe two harps and an owl ſitting upon them. Silver coins of Gelon in Sarmatia reſembling the Syrian. The ſituation of this town is very much unknown. It ſeems to have been ſituated on the north of the Euxine ſea, where ſome Sarmatic or Sclavonic tribes were mingled with the Scythians or Goths. The Greek imperial braſs coins are very numerous. A ſeries of almoſt all the emperors may be had from thoſe of Antioch, with a Latin legend on the obverſe and Greek on the reverſe. Thoſe of Bithynia and Phrygia remarkable for good workmanſhip. The coins of Tarſus remarkable for their curious views of objects, almoſt in perſpective. The Egyptian coins, from the time of Auguſtus to Nero, are worſe executed than afterwards. From Nero to Commodus they are frequently of admirable workmanſhip, and in a peculiar ſtyle, diſtinct both from the Greek and Roman. From the time of Commodus they decline, and are loſt after the reign of Conſtantius I. The Egyptian braſs coins of the Roman period are likewiſe of excellent workmanſhip, eſpecially in the time of Antoninus Pius.

Table II. *Roman Coins.*

I. The conſular coins, called alſo the coins of families, and arranged alphabetically in cabinets, according to the names of the families which appear on them. They are,

1. *Braſs Coins.*—Theſe conſiſt chiefly of large pieces of rude workmanſhip without any intereſting imagery. In cabinets they are generally kept in boxes apart by themſelves. The as bears the head of Janus; the ſemis of Jupiter with S; the triens of Minerva with four ciphers; the quadrans of Hercules with three ciphers; the ſextans of Mercury with two cyphers; and the uncia bears the head of Rome with one cipher. In all theſe pieces the prow of a ſhip is conſtantly the figure on the reverſe, with very few exceptions. Sometimes, indeed, they have a ſhell, two heads of barley, a frog, an anchor, or a dog, on the reverſe. About the time of Julius Cæſar both the obverſes and the reverſes of the coins began to be altered.

2. *Silver.* Of this the denarius was the firſt and principal coin. It was ſtamped originally with X, denoting that the value was ten aſes. On the reverſe was Caſtor and Pollux, or a chariot of Victory. Afterwards the buſts of various deities make their appearance; and in the ſeventh century of Rome the portraits of illuſtrious perſons deceaſed are met with: but till the time of Julius Cæſar no figure of any living perſon is to be met with; Julius himſelf being the firſt who aſſumed that honour. The workmanſhip on the beſt and worſt ſilver is much the ſame. The reverſes are very curious, and point out many remarkable events in Roman hiſtory; but none of theſe occur till about a century before the Chriſtian era. The large denarii, with Roma, are the moſt ancient; and ſome of theſe bear the Pelaſgic A, not the Roman. The ſilver ſeſtertii have a head of Mercury, with a caduceus on the reverſe. The quinarii have always a head of Jupiter, with a Victory on the reverſe.

3. *Gold.*—Moſt of theſe are of great value. The number of theſe exceeds not 100; thoſe of braſs 200; and of ſilver 2000. The aureus is the general gold coin; but two or three gold ſemiſſes of families likewiſe occur.

Ancient Coins.

II. Roman imperial coins.

1. *Brafs.*—This is of three fizes; large, middle, and fmall. The firft forms a moft beautiful feries, but very expenfive. The various colours of the patina have the fineft effect. It is the moft important of all the Roman coins, and exceeds even the gold in value.

The middle brafs is next in value to the former; and in it are many rare and curious coins, particularly interefting to Britons, as elucidating the hiftory of the ifland. Of thefe are the triumphal arch of Claudius; the EXERC. BRITANNICUS of Adrian; the coins of Antoninus Pius, Commodus, Severus, with a Victory, VICTORIA BRITAN.: but efpecially thofe perfonifying the country BRITANNIA. "The number of Roman coins relating to Britain (fays Mr Pinkerton) is remarkable, more than 20 having been ftruck at various times; while thofe perfonifying Italy, Gaul, Spain, and other regions of the empire, exceed not four or fix at moft for each country. Only one country vies with Britain, and that is Dacia on the extreme north-eaft of the empire, as Britain on the extreme north-weft. No doubt this circumftance of remotenefs in thefe two countries recommended them to this particular attention, as more expreffive of the Roman power.

The fmall brafs feries abounds alfo with curious coins. They are fcarce till the time of Valerian and Gallienus, but very common afterwards. Mr Pinkerton recommends, therefore, to form a feries in filver as well as brafs; both being the cheapeft of all the Roman coins. "In this feries (fays he), it is a common fault to arrange many coins which have been plated with gold or filver, the forgeries of ancient times, but which time has worn off either wholly or in part. All real brafs coins have the S. C. till the time of Gallienus; as the fenate alone had the power of ftriking brafs, while the emperor himfelf had that of gold and filver. When the S. C. therefore, is wanting, the coin was certainly once plated; as, in general, the different type and fabric, being thofe of gold and filver, fufficiently fhow themfelves. With Pertinax, A. D. 192, there is a temporary ceffation of fmall brafs; nor after him do any princes occur in that feries till Valerian, A. D. 254, excepting Trajanus Decius, A. D. 250 only. After Valerian the feries is continuous and common. The brafs coinage gradually declined in fize from the time of Severus; fo that parts of the as could not be ftruck, or at leaft it was held unneceffary to ftrike them. Trajanus Decius attempted in vain to reftore the coinage; and Valerian and Gallienus were forced to iffue denarii ærei and fmall affaria. The feries of large and of middle brafs are of two fixed and known fizes; the former about that of our crown, the latter of the half crown: though after Severus they gradually leffen. But the fmall brafs takes in all parts of the as; and every brafs coin not larger than our fhilling belongs to this feries. The *minimi*, indeed, or very fmalleft, it is proper to keep apart. The coins of Julius Cefar in this fize are of peculiarly fine workmanfhip. They bear his portrait reverfe of Auguftus, or the reverfe has a crocodile EGYPTO CAPTA. There are feveral with Mark Anthony, and fome with Cleopatra; but the more common pieces are thofe with only numerals on the obverfe, which go the length of XIII; probably tickets for the baths. A great many occur in the time of Nero; of which Mr Pinkerton particularifes one which has "on the reverfe a table ornamented with griffins and other devices. Upon it is placed a wreath of laurel, and a beautiful vafe, of which the emboffed human figures are fo minute, and finifhed fo furprifingly, as to ftamp thefe coins the moft exquifite productions of the ancient mint." From the time of Nero to that of Vefpafian no fmall brafs occurs: but there are many of this emperor and of his fon Titus; while Domitian has as many as Nero, and Domitia his wife has almoft as many.. Succeeding emperors to the time of Pertinax have alfo many brafs coins; but from his time to that of Valerian there are no real fmall brafs, excepting thofe of Trajanus Decius. After Gallienus there are a great many coins of this kind; and Mr Pinkerton mentions one in Dr Hunter's cabinet, of an unknown perfon named Nigrianus. The coin feems to have been ftruck at Carthage; and our author concludes that he was an African Ufurper, father to Nigrinianus.

2. *Silver.*—This feries is very complete, and the cheapeft of any; efpecially as the fmall brafs becomes a fine fupplement to it: the latter being had in plenty when the filver becomes fcarce, and the filver being plentiful when the brafs is fcarce.

3. *Gold.*—The Roman imperial gold coins form a feries of great beauty and perfection; but on account of their great price are beyond the purchafe of private perfons.

4. *The colonial coins* occur only in brafs, none, excepting that of Nemaufus, having a right to coin filver. They begin in Spain with Julius Cæfar and Anthony, and ceafe with Caligula, who took away the privilege of coinage from the Spanifh colonies. The moft beautiful are thofe of Corinth. The other remarkable colonial coins are thofe of Emerita, Ilice, Terraco, Caffandria, Babba, Berytus, Cæfarea, Patræ, Emifa, Heliopolis or Balbec, Ptolemais, Sidon, Tyre, Deulton, Dium, Troas, Rhefaina, Neapolis of Samaria, which bears a reprefentation of Mount Gerizzim with the temple on it, Hippo in Africa, &c. On many of thefe coins we meet with fine reprefentations of temples, triumphal arches, gods, goddeffes, and illuftrious perfons. But coins with thofe reprefentations are by no means common; the colonial coins till the time of Trajan bearing only a plough, or fome other fimple badge of a colony. Camelodunum is the only colony in Britain of which we have any coins.

5. The *minimi.*—This includes the fmalleft coins of all denominations, moft of which do not exceed the fize of a filver penny. They are the moft curious of all; but no feries of them was ever formed by any perfon except the Abbe Rothelin, whofe collection formed of all metals paffed to the queen of Spain. The reafon of the fcarcity of thefe fmall coins is probably their diminutive fize; by reafon of which they are moftly loft.

It is furprifing that numbers of Roman coins are found through all countries once fubject to that powerful people. Some have been met with in the Orkneys,

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neys, and many in the moſt remote parts of Europe, Aſia, and Africa, known to the ancients.

Table III. *Coins of other ancient Nations.*

1. The Lydians appear to have invented coinage; though, perhaps, this honour may be diſputed with them by the Greeks.

2. The Aſſyrians, Medes, Babylonians, Phenicians, and Egyptians, had no coins. In the mouths of the mummies are only thin, unſtamped, and round pieces of gold to pay Charon's fare.

3. No Indian or Chineſe coins are to be met with till a very late period; and even then ſo rude as ſcarce to be worth notice. Voltaire mentions a collection of ancient Chineſe and Indian coins made by the emperor of China in 1700; but Mr Pinkerton ſuppoſes it to have conſiſted only of the Greek and Roman money which had been introduced into theſe countries.

4. The Lydian coins have no legends; ſo that mere conjecture only determines the ancient coins of electrum and ſilver found in Aſia, and different from the Perſian, to belong to Lydia. Crœſus coined gold into a form which he called *ſtaters*; and Mr Pinkerton mentions a very ancient gold coin in Dr Hunter's cabinet, which he ſuppoſes to have been one of theſe. It has a globous figure, with indented marks on one ſide, and on the other a man kneeling, with a fiſh held out in the left hand, and a ſword depending in the right. It weighs four drams; which Joſephus tells us was the weight of the Lydian gold coins. In the ſame collection are other gold coins little inferior in antiquity; the moſt ancient of which, our author ſuppoſes, may have been coined by the cities of Aſia Minor, as coinage paſſed through them to Greece. They are of admirable workmanſhip, and as much ſuperior to the beſt Sicilian coins, as the latter are to all the reſt in the world. Theſe gold coins are all extremely pale; owing to the want of knowledge in refining gold.

5. Perſian coins.—Theſe were firſt ſtruck by Darius Hyſtaſpes, whence they had the name of *Darics*. They are of gold, and generally have the figure of an archer: they weigh about four drachms; and ſome occur with the indented mark on one ſide, while others have figures upon both. The ſilver coins have generally a king in a chariot of two horſes, with a charioteer, and ſometimes another figure on foot behind on the obverſe; while the reverſe preſents a ſhip, ſometimes a ram, bull, or other animal. The gold coins, which only had the title of *Darics*, are extremely ſcarce, having been melted down, as is ſuppoſed, and recoined by Alexander the Great on his conqueſt of Aſia.

There is a ſecond ſeries of Perſian coins beginning with Artaxares, or Artaxerxes, who overthrew the Parthian monarchy about the year 210. Theſe are large and thin, with the king's buſt on one ſide and the altar of Mathras on the other; generally with a human figure on each ſide. Theſe coins continue till the year 636, when Perſia was conquered by the Saracens. Theſe have only Perſian letters upon them, which have never been explained by any antiquaries. Mr Pinkerton ſays that they ſeem to partake of the ancient Greek, Gothic, and Alanic.

6. The Hebrew ſhekels, originally didrachms, but after the time of the Maccabees tetradrachms, are almoſt all forgeries of modern Jews, as well as the braſs coins with Samaritan characters upon them. They have all a ſprig upon one ſide and a vaſe on the other. Mr Pinkerton ſays, that the admiſſion of one of them into a cabinet would almoſt be a diſgrace to it.

7. Phœnician and Punic coins are very intereſting on account of the great power and wealth of theſe nations. The alphabets have been cleared by their relation to the Hebrew and Syriac languages.

8. The coins of Palmyra come under the ſame denomination with the former, Palmyra being a Syrian city.

9. The Etruſcan coins have the characters of that nation, which have been explained by their affinity to the Pelaſgic, or oldeſt Greek and Latin.

10. The Spaniſh coins are inſcribed with two or three alphabets allied to the old Greek or Punic; but the inſcriptions have not been ſufficiently explained.

11. Gauliſh coins.—Theſe are numerous; but the moſt ancient have no legends; and even after the Greek letters were introduced into Gaul by a colony at Marſeilles, the legends are very difficult to be explained.

12. Britiſh coins. From a paſſage in Cæſar's commentaries, it has been inferred that the Britons uſed ſome kind of coins even in his time. Mr Pinkerton informs us, that ſome rude coins of copper very much mingled with tin are frequently found in England; which, he ſuppoſes, may be ſome of the ancient Britiſh money. They are of the ſize of a didrachm, the common form of the nummus aureus among the ancients. After the time of Cæſar, coinage increaſed among the Britons; and there are many found of Cunobelinus mentioned in the Roman hiſtory. Moſt of theſe have on one ſide CUNO, with an ear of wheat, a horſe, a kind of head of Janus, or other ſymbol; and have frequently alſo the letters CAMU; ſuppoſed to mean Camelodunum. Sometimes the word TASCIA occurs; the meaning of which has not yet been explained.

13. Gothic coins of France, Italy, and Spain, to the time of Charles the Great. Theſe have the Roman characters upon them. The Italian coins are moſtly of the ſize of ſmall braſs; and in this way we meet with coins of Athalaric, Theodahat, Witigez, and other Gothic princes. Many others occur, the inſcriptions of which, though meant for Roman, are ſo perverted as to be illegible.

Table IV. *Modern Coins.*

1. Of Japan.—Theſe are thin plates of gold and ſilver, of an oval figure, with ſmall marks or figures ſtamped on them.

2. China.—Theſe are only copper, about the ſize of a farthing, with a ſquare hole in the middle to put them on ſtrings. The inſcriptions on them do not expreſs the name of the ſovereign, but the year of his reign; as the *happy year*, the *illuſtrious year*, &c.

3. The Tartarian coins are rude, having only inſcriptions upon them; and they are all poſterior to the time of Jenghiz khan.

4. Coins of Thibet, Pegu, and Siam, are much the

ſame,

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fame, prefenting only infcriptions without any figures. They are alfo of late date.

5. India.—Some old coins have been found in the neighbourhood of Calcutta, of gold, filver, copper, and tin, all mixed together. Thefe have commonly a warrior with a fword on one fide and an Indian female idol on the other, of the fame form with the celebrated fculptures in the ifland of Elephanta; but it is impoffible to tell what antiquity they are of. The modern coins are the pagoda of gold, worth little more than fix fhillings; the roupee of filver upwards of two fhillings; and the cafh, of copper. There is a remarkable fet of roupees, which fhow the twelve figns; a lion on one, a bull on another, &c. but the occafion on which they were ftruck is unknown. The other coins of India have generally Perfian infcriptions upon them.

6. Perfia.—The Perfic coins fince its conqueft by the Arabs continue on the Arabian model.

7. Arabia.—Some coins of the petty princes of Arabia are met with as old as the imperial ages of Rome; but till the time of Haroun Alrafhid, no regular coinage appears in the vaft empire of the Saracens. Even then the reverfe has only an infcription, and the obverfe is copied from any Greek or Syrian coin which happened to fall in the moneyer's way. The later Arabian coins are moftly filver, with the name and titles of the prince on one fide, and fome infcription from the Koran on the other. The more modern coins of this country are in the fhape of a fifh-hook, with Arabic infcriptions.

8. Turkey.—No regular coinage was formed by the Turks till they became mafters of Conftantinople. They refemble thofe of Perfia and Arabia, having merely infciptions on both fides.

9. The coins of the African ftates, at leaft fuch as profefs the Mohammedan religion, have merely infcriptions without any figures: thofe of the internal parts are unknown; and no coinage was ufed among the Mexicans and Peruvians, the only civilized nations in America; but La Hontan mentions an American favage who had a fquare medal of copper depending from his neck. Mr Pinkerton fuppofes it to have come from Japan.

10. Modern Italic coins. Befides the Gothic princes mentioned in the former table, the exarchs of Ravenna coined money with the infcription FELIX RAVENNA, &c. The Lombards iffued no coins, but there are fome ftill extant of Charlemagne. The following lift fhows the origin of the coinage in various Italian ftates.

Rome. Papal coinage originates with Hadrian I. Size of filver pennies, with the Pope's name on one fide, and SCOS PETRUS on the other. No coins appear from 975 to 1099, excepting of Leo IX. In 1303 appear pennies of the fenate and people of Rome, with Peter on the one fide and Paul on the other. There are groats of Clement V. with his portrait three quarters length; but the fide-head begins with Sixtus V. in 1470. Gold was firft coined by John XXII. in 1316. The coins of Alexander VI. Julius II. and Leo X. are remarkable for beauty and elegance.

Milan. Coinage began with Charlemagne. The firft coin of the family of Vifconti occurs in 1330 under Azo. The fet finifhes with Louis XII.

Naples. Coinage begins in 840 and 880, with Duke Sergius and Bifhop Athanafius. The next coins are of Roger of Sicily, and Roger II. in 1130, William I. II. and Tancred. Naples and Sicily were fubdued in 1194 by the emperor of Germany; in 1255 Manfred appears; in 1266 Charles of Provence; and others till Joan in 1414: after which follow the houfe of Arragon, and later kings.

Venice begins in the 10th century. The firft coins are filver pennies marked VENECI. Then follow the coins of Henrico Dandulo in 1192, of Ziani in 1205, &c. Gold was firft coined at Venice in 1280, and copper in 1471; but the filver groats are as old as 1192.

Florence. Silver was coined here in the 12th century, or before; but in 1252 the firft gold coins ftruck in Europe after the 8th century made their appearance, and were named *florins* from the flower of the lily upon them. They were imitated by the popes, by France, and England. They have on one fide St John the Baptift ftanding, on the other a large *fleur de lis*, and it is not doubted that the French *fleurs de lis* took their origin from thefe coins. They weigh a drachm, and are no lefs than 24 carats fine according to Italian writers, and are worth about 12 fhillings.

Geneva firft began to coin money in 1129, under the government of Conrad. Thofe of the dukes of Savoy began in the fame century.

Aquileia. Coins were iffued from this city by the patriarchs from 1204 to 1440.

Ferrara. Coins of the marquifes from 1340.

11. French coins During the race of Clovis, from 490 till 751, the coins are chiefly gold *trientes*, with fome *folidi* and *femiffes*. The former are of good workmanfhip, with the heads of kings. The reverfe has a crofs, with the name of the town where they were ftruck.

The coins of the fecond race begin with Pepin in 751, and continue till Hugh Capet in 987. The coins of the firft race are elegant, but thofe of the fecond entirely the reverfe, being almoft all filver pennies, and feldom bearing the portrait of the king. Thofe of Charlemagne have only CAROLUS in the field; while the reverfe bears R. F. or fome fuch infcription; though one piece ftruck at Rome has a rude buft of him. The coins of Louis le Debonnaire are better done.

The third race begins with Hugh Capet in 987, and extends to this time. The coinage did not begin to improve till 1226 under St Louis, when the groat appears. Its name in Italian is *groffo*, in French *groffe*, in Englifh *groat*, or great coin; fo called from its fize in comparifon with the penny; and it paffed from Italy to France, to Germany, and to England. After the conqueft of France by the Englifh, bafe coins of many kinds were introduced; and in the year 1574, in the time of Henry III. copper was firft introduced into the French coinage. Befides thefe, the other remarkable coins of France are, the blancs or billon groats, firft iffued in 1348; the *ecus a la couronne*, or crowns of gold, fo called from the crown on one fide, and

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and begun by Charles VI. in 1384; those of Ann of Bretagne in 1498: the *teston*, or piece with the king's head, of Louis XII.; the *Henri* of Henry II. with Gaul sitting in armour, and a Victory in her hand. There are many coins of cardinal Bourbon, elected king in 1589; and in 1642, Louis XIV. takes the title of CATALONIÆ PRINCEPS. The first *Louis d'Or* made its appearance in 1640; but such was the poverty of France, if we believe certain authors, that in 1719 the duke of Orleans regent struck copper for silver.

12. Spanish coins. The most early series of these consists almost entirely of trientes, finely done. On one side they have the head of the king with his name, and on the other a cross, with the name of the town, commonly in Bœtica, or the south part of Spain, where there were a great many Roman colonies, and which was fertile to a proverb. The Moresque coins of Spain, like those of the rest of the Mohammedan states, present us only with insipid inscriptions on both sides. Indeed the Mohammedan religion, by its absolute refusal to allow the representation of any living creature, has prevented the progress of coinage in any degree throughout those regions which it has overspread. The inscriptions on the ancient Spanish coins are in the Cufic or old Arabic characters.

13. Portugal. No description of the coins of this kingdom has yet appeared.

14. Germany. No account of the German coins has been published; though it is well known that not only the emperors, but many of the cities, particularly those called *Hanse-towns*, issued money; and many of the coins issued by the cities were superior in elegance even to those issued by the emperors

15. Denmark. Here the coinage begins with Canute the Great in 1014. The pieces are at first extremely rude, ornamented only with rings and runic characters. These are succeeded by copper pieces, some of which have a cross, others a pastoral staff on one side, with the letter A on the other. Later coins have strokes IIII, &c. all round them; but those of Harold, Hardicanute, and Magnus Bonus, in 1041, are of neat workmanship, and have the portraits of the princes at half length. The coins of Nicolas or Niel, as he is called by the Danes, are rude, as well as those of Waldemar I. and the celebrated Margaret. In 1376 Olaf caused money to be struck with a grinning full face, with a crowned O upon the other side. "The Swedes (says Mr Pinkerton) took these coins extremely ill, as they thought they grinned at them." Silver was first coined in Denmark by Philippa queen of Eric, and daughter to Henry IV. of England.

16. Sweden. The coinage of this kingdom began in 818 under Biorno, on the plan of Charlemagne. The coins are marked with a cross. Next follow those of Olaf in 1019; which Mr Pinkerton supposes to have been the first true Swedish coins; and that the art of coinage first passed from England into Denmark in the time of Canute the Great, and from Denmark into Sweden. These coins were struck on the English model. During the time that Sweden was subject to Denmark, or miserably harassed by the Danes, the coins of both kingdoms were the same; but after the time of Gustavus Vasa many elegant pieces appear. In 1634, dollars were coined with the portrait of Gustavus Adolphus, who was killed two years before: On the reverse they have the arms of Sweden, with the chemical marks of mercury and sulphur. In 1716, 1717, and 1718, Charles XII. being in extreme want of money, issued small copper coins with Saturn, Jupiter, Mars, &c. upon them, to go for dollars; and on account of this scheme, Baron Goertz, the suggestor of it, was brought to the block.

17. Norway. The coins of this country begins with Olaf in 1006; after which time there are various coins of other princes; but copper was not coined till the year 1343.

Besides the coins already mentioned, there are ecclesiastic coins of France, Germany, Denmark, Sweden, Norway, &c. Those of Denmark and Sweden are numerous, but the Norwegian coins of this denomination are rare. Mr Pinkerton describes a silver one in his possession as having arms and a mitre, with the inscription on one side SANCTUS OLAWS REX NORVEY; on the reverse OLAWS DEI GRA. ARCEP. NID'SEN, meaning NIDROSIENSIS, or archbishop of *Nidros*, now Drontheim.

18. Bohemia. The coinage of this kingdom appears at a very early date, viz. in the year 909, under duke Boleslaus I. These coins are followed by others of Boleslaus II. and Emma his wife in 970; of Boleslaus III. in 1002; Jaromir in 1020; Udalrich in 1030, and other princes. The *bracteate* money of Ottocar I. was coined in 1197.

19. Poland. The coinage of this country is nearly as ancient as that of Bohemia. The coins are on the German model, but no particular account of them has been published.

20. Russia. None of the Russian money appears to be more ancient than the 13th century. The first are the *kopecks* or silver pennies, which have upon them rude figures of animals on one side, and a man standing with a bow or spear on the other. There are likewise coins of Moscow struck by Aristoteles the architect in 1482. The *roubles* or dollars and their halfs. There are some of the impostor Demetrius in 1605, which are very scarce.

21. Prussia. The first Prussian coins were struck at Culm by the Teutonic knights in 1230. They were silver pennies, and upon the German plan. In the next century were struck shillings, groats, and *schots*; the last were the largest, and are extremely rare. They have the Prussian shield, an eagle surmounting a cross, with a rose-shaped border, MONETA DOMINORUM PRUSSIÆ: on the reverse is a cross fleurie, within a border of a similar kind, having the inscription HONOR MAGISTRI, JUSTITIAM DILIGIT.—Gold coins were struck in the same century. In the time of Copernicus the money was so debased, that 12 or 13 marks were worth but one of pure silver.

22. England. The English coins are of various kinds.

1st. *Heptarchic*. These are only of two sorts, viz. the *skeatta* or penny of silver, and the *styca* of copper. Few of the pennies appear till after the year 700; though some are met with which bear the name of Ethelbert I. king of Kent, as old as 560. At first they had only rude figures of serpents, but in latter

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times legends were likewiſe added. Moſt of theſe pennies have pagan ſymbols upon them. The ſtyca was only coined in Northumberland, and was a very ſmall piece about the value of half a farthing.

2d. Coins of the *chief monarchs* of England. Mr Pinkerton denies that an end was put to the heptarchy by Egbert in 832, as is commonly ſuppoſed; though he owns that he was *chief monarch* of the country, as ſeveral others had been before him. Edgar, who reigned in 959, according to him was the firſt king of England; and the coins of the chief monarchs form almoſt a complete ſeries from the time of Egbert to Edgar. The only chief monarch of whom there are no coins is Ethelbald, who reigned in 857. Moſt of theſe coins bear rude portraits; but the reverſes are ſometimes curious and intereſting. Some have views of cathedrals and other buildings; particularly one of Edward the Elder in 900; which has the cathedral of York with three rows of windows, round arched as the other Saxon and Norman buildings; the Gothic arch being quite unknown till after the 12th century. Some coins of Anlaf king of Northumberland have the famous raven, the Daniſh enſign; and thoſe of other princes have frequently very curious reverſes.

3d. *Eccleſiaſtic* coins appear of the archbiſhops of Canterbury, Wulfred, in 804, Ceolnoth in 830, and Plegmund in 889.

4th. Coins of the *kings* of England. The ſilver penny, which had begun during the heptarchy, continued to be the general coin after the kingdom had been united under one head; and extends in a continued ſeries from Egbert almoſt to the preſent reign. The only kings wanting are Edmund Ironſide, Richard I. and John. At firſt the penny weighed $22\frac{1}{2}$ grains; but towards the cloſe of the reign of Edward III. it fell to 18 grains; and in that of Edward IV. to 12. In the time of Edward VI. it was diminiſhed to eight grains; and in Queen Elizabeth's reign to $7\frac{23}{31}$; at which it ſtill continues.

Halfpennies and farthings were firſt ſtruck in ſilver by Edward I. in 1280; the former continued to the time of the commonwealth, but the latter ceaſed with Edward VI. The groat was introduced by Edward III. in 1354, and continues to this day, though not in common circulation. The half-groat or twopence is of the ſame date, and alſo continues to the preſent time.

Shillings were firſt coined by Henry VII. in 1503. At firſt it was called *teſtoon*, from the *teſte*, *tete*, or head of the king upon it; the name *ſhilling* being derived from the German *ſchelling;* under which appellation coins had been ſtruck at Hamburgh in 1407. The crown was firſt coined in its preſent form by Henry VIII. Formerly it had appeared only in gold, whence the phraſe of crowns of gold; though theſe indeed were the largeſt gold coins known for a long time in France and other countries on the continent, being worth about 10s. ſterling. They had their name from the crown ſtamped on one ſide, and were firſt coined by Charles VI. in 1384, and continued till the time of Louis XIV. The half-crown, ſixpence, and threepence, were coined by Edward VI. In 1558 Queen Elizabeth coined three halfpenny, and in 1561 three farthing pieces; but they were diſcontinued in 1582.

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From the year 1601 to the preſent time the coins of England remain the ſame.

Gold was coined in England by Henry III. in 1257; the piece was called a *gold penny*, and was larger than the ſilver one; and the execution is by no means bad for the time. The ſeries of gold coinage, however, commences properly from Edward III. In 1344 this monarch firſt ſtruck florins, in imitation of thoſe in Italy; and it is remarkable, that though theſe coins at the time they were firſt iſſued bore only ſix ſhillings value, they are now intrinſically worth 19s.; ſo much has the value of gold increaſed ſince that time. The half and quarter florin were ſtruck at the ſame time, but only the laſt has been found. The florin, however, being found inconvenient, gave place to the noble of 6s. 8d. value, and exactly half a mark. The latter had its name from being a limited ſum in accounts; and was eight ounces in weight, two-thirds of the money pound. It is ſometimes alſo called *ſelibra*, as being one half of the commercial pound of 16 ounces. The noble had its name from the nobility of the metal; the gold of which it was coined being of the fineſt ſort. Sometimes it is called *Roſe Noble*, from both ſides being impaled in an undulating circle. It continued with the half and quarter noble to be the only gold coin till the angels of Edward IV. appeared in 1465. Theſe had their name from being ſtamped with the image of Michael and the dragon. The angelites of 3s. 4d. value were ſubſtituted in their place. In 1527 Henry VIII. added to the gold coins the crown and half-crown at their preſent value; and the ſame year he gave *ſovereigns* of 22s. 6d. and *ryals* of 11s. 3d. angels at 7s. 6d. and nobles at their old value of 6s. 8d. In 1546 he cauſed ſovereigns to be coined of the value of 20s. and half ſovereigns in proportion. His gold crown is about the ſize of our ſhilling, and the half-crown of ſixpence, but thin. All his coins, however, gold as well as ſilver, are much debaſed; and it was not without much labour and trouble that Edward VI. brought it back to its former ſtandard. On the union of the two crowns, James gave the ſovereign the name of *unite;* the value continuing of 20s. as before. He coined alſo roſe-ryals of 30s. value, ſpur-ryals of 15s. angels of 10s. and angelets of 5s. Under the commonwealth, the ſovereign got the name of the *twenty-ſhilling* piece, and continued current till the coinage of guineas. Theſe were ſo called from their being coined of Guinea gold, and were at firſt only to go for 20s. though by an univerſal but tacit conſent they always paſſed for 21s. Half-guineas, double guineas, and five guinea pieces, were alſo coined during the ſame reign; which ſtill continue, though the two latter are not in common circulation. Quarter guineas were coined by George I. and likewiſe by his preſent majeſty; but they were found ſo troubleſome on account of their ſmall ſize, that they were ſtopped within a year or two when received at the bank of England; and thus are not to be met with at preſent. A few pieces of 7s. value have likewiſe been coined, and are known by the lion above the helmet; but none have been iſſued. In 1688 the guinea roſe to 21s. 6d. and continued to increaſe in value till 1696, when it was as high as 30s.; but after the recoinage in 1697 and 1698 it fell by degrees, and in 1717 was at its old ſtandard of 21s. and at that time ſilver

was

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was fixed at its prefent ftandard value, viz. as 1 to 15½ in weight.

Though the firft money coined in Britain, as we have already obferved, was copper, yet, excepting the Northumbrian ftycas, no copper coin was found in England from the time of the Saxon conqueft till the year 1672. An averfion to a copper coinage it feems was prevalent throughout the nation; and Queen Elizabeth, who without hefitation ufed bafe money for Ireland, yet fcrupled at coining copper for England. This want of fmall coin occafioned fuch an increafe of private tokens for halfpennies and farthings, that it became a ferious object to government; and in 1594 a copper coinage was ferioufly thought of This year a fmall copper coin was ftruck about the fize of a filver twopence, with the queen's monogram on one fide, and a rofe on the other; the running legend on both fides being THE PLEDGE OF A HALFPENNY. Of this there are patterns both in copper and filver, but both of them foon fell into difufe. On the 19th of May 1613, King James by royal proclamation iffued farthing tokens. They are generally of the fame fize with the two pence, with two fceptres in faltier furmounted with a crown, and the harp upon the other; with an intention, as it would feem, that if they were refufed in England they might pafs in Ireland. In 1635 Charles I. coined thofe with the rofe inftead of the harp; but the circulation of thefe was entirely ftopped by the vaft number of counterfeits which appeared, and by the king's death in 1648. After this the private tokens began again to circulate, till put a ftop to by the coinage of farthings in 1672. The workmanfhip of the tokens is quite contemptible. In 1672 the halfpence as well as the farthings which had been ftruck two years before began to circulate. They were of pure Swedifh copper, the dyes engraved by Roettier; and they continued till the year 1684, when fome difputes arofe about the copper lately obtained from the Englifh mines. Tin farthings were coined with a ftud of copper in the centre, and infcribed round the edge as the crown pieces, with NUMMORUM FAMULUS, 1685 or 1686. In 1685 halfpence of the fame kind were coined; and the tin coinage continued till the year 1692, to the value of more than L.65,000; but next year the tin was all called in by government, and the copper coinage recommenced. The farthings of Queen Anne are all trial pieces excepting thofe of 1714, the laft year of her reign. "They are (fays Mr Pinkerton) of exquifite workmanfhip, exceeding moft copper coins either ancient or modern, and will do honour to the engraver Mr Croker to the end of time. The one, whofe reverfe is Peace in a car, PAX MISSA PER ORBEM, is the moft efteemed; and next to it the BRITANNIA under a portal. The other halfpence and farthings are lefs valuable.

23 Scotland. Silver pennies of Alexander I. who reigned in 1107, are believed to exift; and there certainly are fome of Alexander II. in 1214. There are likewife coins of David in 1124; but perhaps none of Malcolm IV. his fucceffor, whofe reign was very fhort. There are many coins of William I. in 1165; and a large hoard of his pennies was found at Invernefs in 1780.

The money of Scotland continued to be of the fame value with that of England till the country was drained by the vaft ranfom of David II. after which it became neceffary to reduce its fize; and fo much did this diminution affect England, that Edward III. found himfelf obliged to leffen the Englifh coin alfo. The diminution of the Scottifh coin, however, continued ftill to go on until it became impracticable to keep par with that of England. In the firft year of Robert III. it paffed only for one half its nominal value in England: in 1393, Richard II. ordered it only to go for the weight of the genuine metal it contained. In 1600 it had funk to fuch a degree as to pafs only for a twelfth part of the Englifh money, and continued at that low ebb till the coinage of Scotland was entirely cancelled by the Union of the two kingdoms.

Of filver coins we have only pennies till the year 1293, when Edward I. having coined halfpence and farthings, Alexander III. of Scotland coined alfo halfpence, of which we have a few, but no farthings are to be met with; but there are filver farthings of Robert I. and David II. The latter introduced the groat and half-groat, which completed the fet of Scottifh filver. It continued unaltered till the time of Queen Mary, when they all ceafed to be coined in filver, on account of the high price of that metal. In 1553 fhillings were firft coined, with the buft of the queen on one fide and the arms of France and Scotland on the other. The filver crown was firft coined in 1565, which went for 30 s. Scots; leffer pieces of 20 s. and 10 s. having likewife been ftruck, and marks of filver, worth 3 s. 4 d. Englifh, were alfo coined about the fame time. Thefe coins have upon them the marks XXX. XX. X. to denote their value. They are commonly called Cruickftone dollars, from the palm-tree upon them, miftaken for a remarkable yew at Cruickfton near Glafgow, where Henry Darnley refided. It is defcribed, however, in the act as a palm, with a "fhell-padoc" (a tortoife) crawling up. This alludes to Darnley's marriage with the queen, as the motto from Propertius DAT GLORIA VIRES alfo implies. The motto NEMO ME IMPUNE LACESSET firft appears on the Scottifh coins in 1578, and the invention is given to the celebrated Buchanan. In 1582, the crown of an ounce weight went for 40 s. Scots, and was accordingly marked XL.; in 1597 the mark was L. the Scottifh money being then only one-tenth of the Englifh: the mark was LX in 1601, the value being then reduced to one twelfth, at which it has ever fince continued. In the time of Charles I. half marks, 40 and 20 penny-pieces, were coined. In 1675 the Scottifh dollars firft appeared, in value 56 s. Scots, with halves and quarters of proportional value. In 1686, James VII. coined 60, 40, 20, 10, and 5 s. pieces; but only thofe of 40 and 10 s. are known, with thefe numbers under the buft. At the Union of the kingdoms, all the Scottifh coins were called in, and recoined at Edinburgh, with the mark E under the buft to diftinguifh it; fince which there has been no coinage in Scotland. The Scottifh filver coins are in general equal, if not fuperior, in the workmanfhip to the Englifh.

Gold was firft iffued by Robert II. about 30 years after Edward III. of England had coined the fame metal in that country. The pieces were at firft called St Andrew's, from the figure of that tutelar Saint

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upon the crofs, and who appears on the obverfe with the arms of Scotland, and on the reverfe a lion in a fhield. The lion was another name for the largeft gold coin in Scotland, from the arms of the kingdom upon it. The next was the unicorn, under James III.; which were followed by the bonnet-pieces of James V. Thefe laft are of admirable workmanfhip, being almoft equal to the ancient coins in this refpect. In imitation of the French, the monarch we fpeak of diminifhed the fize of the coin without leffening its weight; an improvement not adopted by the Englifh for a whole century. The laft gold coined in Scotland was the piftole and half piftole, of twelve and fix pounds Scots. Thefe coins have the fun under the head. The gold coins of Scotland fell in the fame proportion with the filver.

The copper coinage of Scotland is of more early date than that of England. It was preceded by money of *billon*, or copper wafhed with filver, called black money. James III. firft coined black farthings in 1466; and this is recorded by hiftorians as one of his greateft faults. This kind of coinage, however, continued as late as the reign of James VI. In his time the true copper coinage began; but as the value of Scottifh money was now declined almoft to the utmoft, the pieces fuddenly affumed a form almoft refembling that of the French coins. The *bodle*, fo called from Bothwell the mintmafter, being equal in fize to the *liard*, and worth two pennies Scottifh, was ftruck. The billon coin, formerly called *bas-piece*, and worth fix pennies Scots, was now coined in copper, and termed the *baw-bee*. Thus it correfponded with the French half fol and Englifh halfpenny, the Scots penny being now equivalent to the French *denier*. Some pieces named *Atkinfons* were coined by James VI. in 1582, when the Scottifh money was to the Englifh as 1 to 8; but on its being ftill farther reduced, they went for 8 pennies, a third more than the value of the baw-bee. Befides thefe there were the hardie and plack, the former being worth three and the latter four pennies Scots. This coinage continued through the reigns of Charles I. and II. but Scottifh coins of the former are, perhaps, the fcarceft of any.

24. Ireland. The firft coins introduced into this kingdom feem to have been thofe of the Danes, and which have only a number of ftrokes around them inftead of letters. In the tenth century, however, this coinage had been confiderably improved; and in 930 and 994 there are pennies ftruck in Dublin, with the infcription ON DVFLI or DYFLI, *Duflin* or *Dyflin* being the Danifh name of that city. There are likewife coins of the Irifh princes themfelves, and of the Englifh monarchs, ftruck in Ireland as early as the ninth century; and it is afferted by fome, that Ireland even in thefe days had been conquered by England; of which, indeed, thefe coins feem to be a proof. None of the Irifh coins of Henry II. are to be met with, but we have fome of the coins of John; and from his time to that of Henry V. the Irifh coins are known by a triangle inclofing the king's head, which appears alfo upon the coins of other nations at this period. The harp does not appear upon the Irifh coins till the time of Henry VIII. Till the time of this monarch, the Englifh and Irifh coins are the fame; but the fame debafement of the coin which at that time took place in England extended alfo to Ireland; but in 1601 copper halfpence and farthings were coined alfo for this kingdom. Thefe circulated in Ireland when James VI. iffued his farthing-tokens of copper, the latter being of two fizes, that if they failed in England they might be fent to Ireland as pennies and halfpence. In 1635 a mint was eftablifhed in Dublin by Charles I. but it was ftopped by the Irifh maffacre, and the many difturbances which followed; fince which time the fcheme has not been refumed. After the maffacre, St Patrick's halfpence and farthings were coined by the Papifts, bearing the legends FLOREAT REX, and on the reverfe ECCE GREX; on the farthing QUIESCAT PLEBS. Copper-tokens were ftruck by towns and tradefmen, as in England and Scotland. In 1680, halfpence and farthings were iffued by authority, with the harp and date. In 1689, James II. having invaded Ireland, inftituted a mint, and coined fhillings and half-crowns of all the refufe metal he could find, particularly fome brafs guns were employed, whence the coinage is commonly called *gun-money*. Even this metal, however, foon became fo fcarce, that a diminution in its fize is quite apparent from June 1689 to July 1690; and as the month of their mintage is marked upon them, this decreafe is eafily perceived. In March 1690, pennies of lead mixed with tin were iffued; and on the 15th of June the fame year, crowns of white metal were coined; but thefe are now very fcarce. In 1722, the patent for coining halfpence and farthings was given to William Wood, which excited fuch difcontent in Ireland. From the fmall fize allowed by the patent to thefe pieces, it was fuppofed that the patentee would have gained 60,000 l. but as he caufed them to be ftruck of a fize ftill fmaller, his gains were eftimated at 100,000 l. The coins, however, are of admirable workmanfhip, and very fine copper, bearing the beft portrait of king George I. to be found any where. Sir Ifaac Newton, at that time at the head of the mint, declared that they were fuperior to the Englifh coins in every thing except the fize. In 1737 the Irifh halfpence and farthings, with the harp on the reverfe, were coined, and continue to the prefent time. In 1760, there was fuch a fcarcity of copper coin, that fome private perfons applied for leave to coin halfpence, which appeared with a very bad portrait of George II. and the words VOCE POPULI around it. No gold or filver has been coined in Ireland fince the maffacre of 1641.

TABLE V. *Modern Medals, properly fo called.*

1 Scottifh medals. Thefe take the lead in the prefent article, the firft modern medals of gold being thofe of David II. ftruck between the years 1330 and 1370. Only two of them now exift; one in the collection of Mr Barker of Birmingham, and the other in that of Dr Hunter. In 1478, there is a medal of James III. fent to the fhrine of St Amboife in France. It is defcribed as of two inches and a third in diameter; the weight near two ounces; having on the obverfe a beardlefs king, with long hair, fitting on a throne, holding in one hand a naked fword; in the other a fhield, with the Scottifh arms. On the borders of the canopy above the throne is an infcription in Gothic letters, IN MI DEFFEN, being corrupt

French

Modern Medals.

French for *In my defence*; a common motto in the Scottish arms. Above the canopy is VILLA BERWICI: the reverse bears St Andrew and his cross, SALVUM FAC POPULUM TUUM DOMINE. There is also a medal of James IV. in the collar of St Michael, having on the reverse a Doric pillar surmounted by a young Janus, standing on a hill, beyond which is the sea, and land on either side. This, however, is by some suspected to be a forgery.

The most remarkable Scottish medals are those of the unfortunate Mary. The first is properly French, having been issued at her coronation as queen of France, along with her husband king Francis II. On the obverse of this piece there are portraits of Francis and Mary, face to face, with three legends around them, the outermost containing their titles; the middle one the following sentence: HORA NONA DOMINUS J. H. S. EXPIRAVIT HELLI CLAMANS; the innermost the name of the city (Paris). On the reverse are the arms of France and Scotland. Fine testoons were also coined upon the same plan, and are now so rare that Dr Hunter gave ten guineas for one he has in his collection. The same portraits appear on the fine crown of Mary and Henry, in 1565, which is so rare as to be esteemed a medal of the highest value; and Mr Pinkerton imagines, that if brought to a sale it would bring 40 or 50 guineas.

Another remarkable medal of Mary represents her full faced, and weeping, with the inscription, O GOD GRANT PATIENCE IN THAT I SUFFER VRANG. The reverse has in the centre, QUHO CAN COMPARE WITH ME IN GRIEF, I DIE AND DAR NOCHT SEEK RELIEF; with this legend around, HOURT NOT THE (figure of a heart) QUHAIS JOY THOU ART. There are also many counters of this unfortunate princess, being thin silver-pieces of the size of a shilling. "They all appear (says Mr Pinkerton) to have been done in France by Mary's direction, who was fond of devices. Her cruel captivity could not debar her from intercourse with her friends in France, who must with pleasure have executed her orders, as affording her a little consolation."

The coronation medal of Charles I. struck at Edinburgh for his inauguration, June 18. 1663, is remarkable as being the only one ever coined of Scottish gold, and the first in Britain struck with a legend on the edge. With respect to the workmanship, it is inferior to Simon's. Of these medals only three are known to exist, of which one is in the Museum. It is not uncommon in silver; in which case it sometimes wants the legend on the edge.

2. Italian medals. These appear in the 15th century, and from that time successively in most European countries. Vittore Pisano, a painter of Verona, is celebrated as the restorer of the art, but it remains to be accounted for how the medals of king David already mentioned came to exist so long before. Mr Pinkerton considers this artist rather as an inventor than a restorer, his medals having no resemblance to the ancient coins, as being large, and all cast. They were first modelled in wax, then a mould taken from the model in fine sand, and other ingredients. After a good cast was procured, it was touched up, and made a model for the rest. These medals of Pisano are almost always inscribed *Opus Pisani Pictoris*. The portraits of a great number of illustrious men were done by him in this manner; and in the British Museum is a large brass medal of Pisano by himself.—Other artists were Boldu, Marescotto, Matth eus de Pallus, Sperandes, Misaldone &c. Towards the end of the century, however, the medals began to assume a more elegant appearance; and the Papal ones are not only the most elegant but the most ancient series of all the modern medals. The improvement began in the reign of Alexander VI. so famous for his own crimes, and those of his nephew Cæsar Borgia. His successors, Julius II. Leo X. Hadrian VI. and Clement VII. had many of their medals designed by Raphael, Julio Romano, and other eminent painters, and the engraving executed by artists of equal merit. Among these were the celebrated Cellini, and the noted Paduan forgers of Roman coins, Cavino and Bassiano. In 1644 Cormanni, a medallic artist, was imprisoned on account of a piece which represented the Pope upon one side, and Olympia Maidalchina, the *relation* of his holiness, on the other. The unfortunate Cormanni poisoned himself. About this time the family of the Hamerani, originally from Germany, began to engrave the papal medals; which they did with surprising merit for several generations. Each of the daughters did a fine medal, as we are informed by Venuti.

Besides the papal medals, there are many issued by the various states of Italy. There are medals of Frederic II. of Sicily in 1501, of several Venetian generals in 1509, of Alfonso duke of Ferrara in 1511, and of the celebrated Andrew Daria in 1528.

3 French medals. Till the reign of Louis XIV. the medals of this country are neither fine nor numerous; but this monarch exceeds all modern princes in this way. Many of his pieces are well designed and executed, though objectionable on account of their falsehood.

4. Danish medals. These appear of Christian II. in 1516, of Frederic and Sophia in 1532, of Frederic I. and Christian III. in bonnets worn in the 16th century. The elephant of the house of Oldenburg is frequent upon Danish medals.

5. Swedish medals. These begin with Gustavus Vasa; and several of Christina are likewise to be met with. There are also some curious ones of Charles XII.

6. Dutch medals. These begin in 1566; and many of them are remarkable for maps and plans, which must be very interesting to posterity. "Had the Greeks and Romans (says Mr Pinkerton) given us maps and plans, what a fine system of ancient geography and topography a cabinet of medals must have been!"

7. Medals of Spain, Portugal, and Germany. The Spanish medals began with Gonsalo in 503, many of which are curious and interesting. Under Cha V. there are many curious Spanish medals; but those of Germany begin with Frederic in 1453. They are extremely numerous; as we may easily suppose from the greatness of the empire, and the various states which compose it. There is a famous medal of Sebastian king of Portugal, famous for his unfortunate expedition into Africa in 1578; with his bust, full face, and three quarters in length. On the reverse is a shell-fish in the sea, with the moon and seven stars, bearing the inscription SERENA CALSA PAVENT. There is also a curious

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curious lozenge-ſhaped coin of the ſame with the arms of Portugal, and the king's name and title: On the reverſe is a croſs with the inſcription IN HOC SIGNO VINCES, 1578.

8. Satyric medals. Theſe began almoſt as ſoon as the knowledge of the art of coining medals was revived. They ſeem to have been almoſt unknown to the ancients. One indeed of the Emperor Gallienus is ſuppoſed to have been ſatyric. It has on the front the emperor's buſt, with the inſcription GALLIENÆ AUG. the reverſe is Peace in a car, PAX UBIQUE; but this has been proved to be only a blundered coin. Some other ancient medal , however, are not liable to this objection. The firſt modern ſatyric medal publiſhed wa that of Frederic king of Sicily in 1501 againſt hi antagoniſt Ferdinand king of Spain. It has on one ſide the head of Ferdinand, with the inſcription FERDINANDUS R. AR. VETUS VULPES ORBIS; on the reverſe a wolf carrying off a ſheep, JUGUM MÆUM SUAVE EST ET ONUS MEUM LEVE. Many others have been ſtruck, of which the wit would now perhaps be difficult to be found out: but of all nations the Dutch have moſt diſtinguiſhed themſelves in this way; and paid very dear for their conduct, as they brought upon themſelves by one or two ſatyric medals the whole power of France under Louis XIV.

9. Engliſh medal . The firſt of theſe is in the duke of Devonſhire's collection. It is of a large ſize, and done on the plan of the early Italian medals. It has on the reverſe the arms of Kendal, with the inſcription TEMPORE OBSIDIONIS TURCORUM, MCCCCLXXX. On the other ſide is a portrait with IO. KENDAL RHODI TURCUPELLERIUS It wa found laſt century in Knareſborough foreſt; but Mr Pinkerton has no doubt of its having been done in Italy The next is that of Henry VIII in [illegible]45, and is of gold, larger than the crown-piece, with the king's head upon the obverſe, and three legends within each other, including his titles, &c. The reverſe contains two inſcriptions, declaring him to be the head of the church; the one in Hebrew, the other in Greek. It was imitated exactly by Edward VI. whoſe coronation medal is the firſt we have. There are two medals of Philip and Mary, whoſe execution is tolerably good; but thoſe of Elizabeth are very poor. There are good medals of Jame I. and his queen; with a fine one of Charles I. and Henrietta, though the workmanſhip is much inferior to the antique. There are many good medals of Charles, with various devices upon their reverſes. Under the commonwealth the celebrated Simon produced medals which are deſervedly reckoned the moſt admirable pieces of modern workmanſhip. There are many good medals of Charles II. James II. and William III. Some are alſo found of James after his abdication. Some fine gold, ſilver, and copper medals, were iſſued in the time of Queen Anne; the two laſt affording a ſeries of all the great actions of the duke of Marlborough. About the year 1740, a ſeries of medal was engraved in London by Daſſier, a native of Geneva, containing all the kings of England; being 36 in number. They are done upon fine copper, and executed with great taſte. There are beſides many medals of private perſons in England; ſo that it may juſtly be ſaid, that this country for medals exceeds almoſt every other in Europe.

To this account of modern coins and medals we ſhall add that of another ſet called *ſiege pieces*, and which were iſſued during the time of a ſiege in caſes of urgent neceſſity. Theſe were formed of any kind of metal; ſometimes of no metal; and Patin mentions a remarkable one ſtruck at Leyden in 1574, when the place was beſieged by the Spaniards. It was of thick paper or paſteboard, having a lion rampant, with this inſcription, PUGNO PRO PATRIA, 1574; and on the reverſe, LUGDUNUM BATAVORUM. There are various ſiege-pieces of Charles I. both in gold and ſilver, ſome of the latter being of the value of 20 ſhillings.

The *nummi bracteati* are a ſpecies of modern coins ſomewhat between counters and money; and have their name from the word BRACTEA, a ſpangle or thin bit of metal. They are commonly little thin plates of ſilver, ſtamped as would ſeem with wooden dies upon one ſide only, with the rude impreſſion of variou figures and inſcriptions. Moſt of them are eccleſiaſtic, and were ſtruck in Germany, Switzerland, Denmark, Sweden, Norway, and a few in Poland. They continued to be in uſe in Germany till the end of the 15th century; and ſome are ſtill uſed in Switzerland at this day.

Abbreviations.

Table of Abbreviations uſed in the Legends of Medals; from Mr Pinkerton.

Greek Coins.

A

Α Athens Argos, A[illegible], Aſylum; p[illegible] [illegible]; as Εφεσιων Α[illegible] Ασι[illegible], "[illegible] he [illegible]ſians, fi[illegible] people of Aſia"

Α[illegible] Abbaſſus, Abdera, Abydus on Hel[illegible]

ΑΒ. Abydus in Egypt

ΑΒΤ. Abydus on Helleſpont

ΑΘ. ΑΘΕ. Athens

ΑΙΓ. Aegi[illegible]

ΑΙΓΟΣΠΟ. Aigoſpotamos

ΑΙΛ. Aelius, Aelia Capitolina

ΑΙΝ. Aenes

ΑΚ.--ΑΚΡΑΤΑΝ. Agrigentum

ΑΚΙ. Acilium

ΑΚΤ. Actium

ΑΛΕ. Alexandria

ΑΜ. Amyntas

ΑΜΒΡ. Ambracia

ΑΜΦΙ. Amphilochia

ΑΝΘ. Ανθυπατον, Proconſul

ΑΝΤΙΣ. Antiſſa

ΑΝΑ. Anactoria

ΑΝΤΙ. A[illegible]tium

ΑΝ. Ancyra

ΑΝΤ. Antoninus, Antioch

ΑΞ. Axus in Crete

ΑΟΝ. Aonitæ

ΑΟΥΕ. Avenio, *Pell.*

ΑΠ. Appius

ΑΠΑ. Apamea.

ΑΠΟ. Apollonia

ΑΠΤΑ. A[illegible]tara

ΑΡ. Aradus. Harma

ΑΡΓΕ. Argennos

ΑΡΓ. Argos

ΑΡΙ. Aricanda

ΑΡΙΜ Ariminum

ΑΡΣΙ. Arſinoe

ΑΡΤ. Artica.

ΑΡΧ. Αρχιερευς or Αρχων, high prie[illegible] [illegible]r magiſtrate

ΑΣΙΑΡΧ. Aſiarchæ, preſidents of the games of Aſia (B)

ΑΣ. Aſylum

Α. Σ. Πρωτοι Συριας, Firſt of Syria

ΑΣΚ. Aſcal[illegible]n

ΑΤ. Atabyrium

ΑΤΑΡ. Atarnæ

ΑΤΓ. Auguſtus

ΑΤΡΗΛ. Aurelius

ΑΥ. ΑΥΤ. Αυτοκρατορ, Emperor.

ΑΥΤΟΝ. Αυτονομοι, enjoying their own laws

ΑΦΙ. [illegible]yta

ΑΦΡ. Africanus

ΑΧ. Achai

B

Β. Βουλης, Council: Berytus: Bithynia

ΒΑΓΗΔΑΟ. Bagadaonia

ΒΑΛ Valerius

ΒΗ. Berytus

ΒΙΤΟΝ. Bitontum

ΒΟΙ. Bœotia

ΒΡΥΝ. Brunduſium

ΒΥ. Byzantium

Γ

Γ. ΓΡ. ΓΡΑΜ. Grammaticus, or keeper of the records

Γ. Gaius, or Caius

ΓΑ. Gallus, Galerius, Gallienus

Γ. Γνωριμου, Illuſtrious

ΓΕΔ.

(B) There were alſo Syriarchæ, Lyciarchæ, Galatarchæ, Bithyniarchæ, Cappadociarchæ, &c. *Morel. Spec.*

Abbreviations.

ΓΕΛ. Gelas
ΓΕΡ. Germanicus
ΓΝ. Gneius
ΓΟΡΤΥ. Gortyna
ΓΡΑ. Gravifca

Δ

Δ. Decimus, Dymæ
ΔΑΚ. Dacicus
ΔΑΜ. Damafcus
ΔΑΡ. Dardanum
ΔΗ Δημος, the people
ΔΗΜΑΡΧ. ΕΞΟΥΣ. with Tribunitian power
ΔΕ. Decelia
ΔΕΚ Decius
ΔΕΡ. Derbe in Lycaonia
ΔΗ Delos
ΔΙ. Diofpolis
ΔΡΕ. Drepanum
ΔΥΡ Dyrrachium

Ε

Ε Eryce
Ε. ΕΡΕΣ Erefus
ΕΛΕΥ. Eleufis
ΕΛΕΥΘ. Ελευθεροι, Free
ΕΠΙ. Epidaurus
ΕΡΙ Eriza in Caria
ΕΡΧ. Erchia
ΕΡΥ. Erythræ
ΕΤ. ΕΤΟ. Ετους, Year
ΕΤ. Etenna in Pamphylia
ΕΧ. Εξουσια. Power
ΕΥ. ΕΥΒΟ. Eubœa
ΕΥΣ. Ευσεβης, Pious
ΕΥΤ. Ευτυχης, Happy
ΕΦ. ΕΦΕ. Ephefus

Ζ

ΖΑ. Zacynthus
ΖΑΝΚΛ. Zancle, Meffana anciently fo called

Η

Η. Elium
ΗΓ. Ηγεμονος, Prefident
ΗΡΑΚ. Heraclea

Θ

ΘΑ. Thafus
ΘΕ. Thefpiæ
ΘΕΣ. Theffalonica
ΘΕ. ΘΗΒ. Thebæ

Ι

Ι. ΙΕΡ. Ιερας, Sacred
ΙΕΡΑΠΥ. Hierapytha
ΙΚΑΡ. Hiccara
ΙΛΙ. Ilium
ΙΟΥ. Julis a city, or Julius
ΙΟΥΛ. Julia
ΙΠΠΑ. Hippana
ΙΡ. Irene Inf. *Pellerin.*
ΙΣ. Ifus, Iftiæa

Κ

Κ. Caius; Κουιντος, Quintus
Κ. ΚΑΙΣ. Cæfar
Κ. Κ. Κοινον Κιλικιας, Community of Cilicia
ΚΑΙΛ. Cælius
ΚΑΛ. Chalcedon
ΚΑΛΛΙ. Callipolis
ΚΑΜΑ. Camara
ΚΑΝ. Canata
ΚΑΠ. Capua
ΚΑΠΠ. Cappadocia
ΚΑΡ. Carrhæ
ΚΑΡΧ. Carthago
ΚΑΥ. Caulonia
ΚΕ. Ceos
ΚΕΦ. Cephalædis
ΚΙ. Cianus, Cibæum
ΚΙΛ. Cilbiani
ΚΛ. Claronæ, Claudius
ΚΛΑ. Clazomene
ΚΝΙ. Cnidus
ΚΟ. Corinth
ΚΟΙΝ. Κοινον, Community
ΚΟΛ. Κολωνιας, Colony, Colophon
ΚΟΜ. Commodus
ΚΟΡ. Corcyra
ΚΡ. Cragus in Lycia
ΚΡΑ. Cranos
ΚΡΗ. Crete
ΚΤΗ. Ctemenæ, *Pell.*
ΚΥ. Cuma, Cydonium, Cyon
ΚΥΘ. Cythnus
ΚΥΠ. Cyprus
ΚΥΡ. Cyrene

Λ

Λ. or L. Λυκαβαντος, Year
Λ. Lucius
ΛΑ. Lacedæmon
ΛΑΜ. Lamea; Lampfacus
ΛΑΡ. Lariffa
ΛΑΡΙ. Larinum
ΛΕ. ΛΕΥ. Leucas
ΛΕΟΝ. Leontium
ΛΗΜ. Lemnos
ΛΙΠ. Lipara
ΛΙΥΙ. Liviopolis
ΛΟ. ΛΟΚ. Locri
ΛΟΓ. Longone
ΛΥΓ. ΛΥΚ. Lyctus

Μ

Μ. Marcus, Malea, Megalopolis, Mazaka
ΜΑ. Maronea, Maffilia, Macedonia
ΜΑΓ. Magnefia
ΜΑΚΡΟ. Macrocephali
ΜΑΜ. Mamertini
ΜΑΣΣ. Maffilia
ΜΑΖ. Mazara
ΜΕ. Menelais, on Syrian regal coins
ΜΕΝΕΚ. Menecrates
ΜΕ. ΜΕΓ. Megara, Megalopolis, Melite
ΜΕΓ. Μεγαλος, Great
ΜΕΣ. Meffana
ΜΕΤΑ. Metapontum
Μ. ΜΗΤΡΟ. Metropolis
ΜΙ. Miletus
ΜΚ. Mazaka of Cappadocia, on coins of Mithridates VI.
ΜΟΡ. Morgantia
ΜΥ. Mycenæ
ΜΥΡ. Myrlea
ΜΥΤΙ. Mytilene

Ν

Ν. Naupactos
ΝΑΞ. Naxos
ΝΑΥΑΡΧ. Ναυαρχιδοι, enjoying a fea-port
ΝΕ. Nemea
Ν. ΝΕΩΚ. Neocori
ΝΕΟΠ. Neopolis.
ΝΕΡ. Nerva
ΝΙΚ. Nicæum, Nicomedia
ΝΥΣ. Nyfæi, on coins of Scythopolis, *Pell.*

Ο

ΟΙ. Oethæi
ΟΝ. Οντος, being.
ΟΠΕΛ. Opelius
ΟΠ. Opus
ΟΡΥ. Orycus
ΟΡΧ. Orchomenus
ΟΥΠ. or ΥΠ. Ουπατος or Υπατος, Conful
ΟΥΗΡ. Verus
ΟΥΗ. Verus
ΟΥΕΣΠ. Vefpafianus
ΟΥΙΤΕΛ. Vitellius
ΟΦΡΥ. Ophrynium

Π

Π. Παρα, Προς, upon
Π. ΠΟΠΛ. Publius
Π. ΠΑ. Paphos or Paros
ΠΑΙΣ. Pæftum
ΠΑΝ. Panormus
ΠΑΡ. Paropinum
ΠΑΡΙ. Paros
ΠΑΡΘ. Parthicus
ΠΕ. Perinthus
ΠΕΛ. Pella
ΠΕΡ. Perges
ΠΕΡΤ. Pertinax.
ΠΕΣΚ. Pefcennius
Π. ΠΗ. Pelufium
ΠΙΝ. Pinamytæ
ΠΛΑ. Plateæ
ΠΟ. Pontus
ΠΟΛΥ. Polyrrhenum
ΠΟΣ. Pofidonia
ΠΡΑΣ. Praffus
Π. ΠΡΥ. Πρυτανος, Præfect
ΠΡ. ΠΡΕΣ. Πρεσβευς, Legate
ΠΡΟ. Proconnefus
ΠΡΟΔΙ. Προδικος, Curator
Π. ΠΡΩΤ. Πρωτος, Firft
ΠΤ. Ptolemais
ΠΥ. Pylos

Ρ

ΡΟ. Rhodes

Σ

Σ. ΣΑ. Salamis, Samos, Syria
ΣΑ. Samofate
ΣΑΛΑΠ. Salapia
ΣΑΡ. Sardis
ΣΕ. Seriphus, Segefte
ΣΕΒ. Σεβαστος, Auguftus
ΣΕΛ. Selinus, Seleucia
ΣΕΠΤ. Septimius
ΣΙ. Siphnos.
ΣΙΔ. Side
ΣΙΝΩ. Sinope
ΣΜΥ. Smyrna
ΣΤΡ. ΣΤΡΑ. Στρατηγος, Prætor
ΣΥΒ. Sybaris
ΣΥ. ΣΥΡΑ. Syracufe
ΣΥΡ. Syria
ΣΩ. Solæ.

Τ

Τ. Titus
ΤΑΒΑΛ. Tabala
ΤΑ. ΤΑΝΑ. Tanagra
ΤΑΡ. Tarentum, Tarfus
ΤΑΥΡ. Tauromenum
ΤΕ. Tementis
ΤΕΡ. Terina
ΤΗ. Tenus
ΤΙ. ΤΙΒ. Tiberius
ΤΡΑ. Trallis
ΤΡΙ. Tripolis
ΤΡΟ. Trœzene
ΤΥΑΝ. Tyana
ΤΥ. Tyndaris.
ΤΥΡ. Tyre (monogram)

Υ

ΥΕ. ΥΕΛ. Velia
ΥΠ. ΥΠΑΤ. Υπατος, Conful

Φ

Φ. Philip; Phœftus, Philuntium
ΦΑ. Phafelis
ΦΑΡ. Pharfalus
ΦΙ. Vibius, Philippopolis
ΦΙΝΕ. Phineium
ΦΛ. Flavius
ΦΟΚ. Phocæum
ΦΟΥΛ. Fulvia
ΦΥ. Phycus in Cyrene.

Χ

Χ. Chios
ΧΑΛ. Chalcis
ΧΕΡ. Cherfonefus
ΧΥ. Chytri in Crete.

Greek Numerals

Α.	1.	Ι.	10.	Ρ.	100.		
Β.	2.	Κ.	20.	Σ. or C	200.		
Γ.	3.	Λ.	30.	Τ.	300.		
Δ.	4.	Μ.	40.	Υ.	400.		
Ε.	5.	Ν.	50.	Φ.	500.		
ς. or ϛ	6.	Ξ.	60.	Χ.	600.		
Ζ.	7.	Ο.	70.	Ψ.	700.		
Η.	8.	Π.	80.	Ω.	800.		
Θ.	9.	ϙ or ϥ	90.	ϡ.	900.		

Examples. I is 10: add A or B, and IA makes 11: fo IB, 12; IΓ, 13, &c. K is 20, KA, 21, &c. PIA makes 111. The Englifh word AIR marks the grand initial numerals. On coins the numerals are often placed in retrograde order; which makes no difference in the value, as every letter is appropriated to its number. Thus ΓΛΤ or ΓΑΤ imply the fame, 333. But this advantage being unknown to the Roman numerals and Arabic ciphers, is apt to puzzle the beginner.

Roman Coins.

A

A. AULUS: in the exergue it implies the firft mint, as ANT. A. coined at Antioch in the firft mint.
A. A. A. F. F. Auro, Argento, Ære, Flando, Feriundo.
A. or AN. Annus.
A. A. Apollo Augufti.
A. F. A. N. Auli filius, Auli nepos.
ABN. Abnepos.
ACT. Actiacus, or Actium.
AD FRV. EMV. Ad fruges emundas.
ADIAB Adiabenicus.
ADOP. Adoptatus.
ADQ. Adquifita.
ADV Adventus.
AED. Ædes.
AED. P. Ædilitia poteftate.
AED. S. Ædes facræ.
AED. CVR. Ædilis Curulis.
AED PL. Ædilis Plebis.
AEL. Ælius.

Abbreviations.

AEM. or AIMIL. Æmilius.
AET. Æternitas.
AFR. Africa, or Africanus.
ALBIN. Albinus.
ALIM. ITAL. Alimenta Italiæ.
ANN. AVG. Annona Auguſti.
A. N. F. F. Annum Novum Fauſtum Felicem.
ANIC. Anicius.
ANN. DCCCLXIIII. NAT. VRB. P. CIR. CON. Anno 864 Natali Urbis Populo Circenſes conſtituti.
ANT. AVG. Antonius Augur.
ANT. Antonius, or Antoninus.
AP. Appius.
A. P. F. Argento Publico Feriundo.
A POP. FRVG. AC. A Populo Fruges Acceptæ.
AQ. or AQL. Aquilius.
AQVA MAR. Aqua Martia.
ARAB. ADQ. Arabia Adquiſita.
ARR. Arrius.
AVG. Augur, Auguſtus, Auguſta.
AVG. D. F. Auguſtus Divi Filius.
AVGG. Two Auguſti.
AVGGG. Three Auguſti.
AVR. or AVREL. Aurelius.

B

B. The mark of the ſecond mint in any city.
BON. EVENT. Bonus Eventus.
B. R. P. NAT. Bono Reipublicæ Nato.
BRIT. Britannicus.
BRVT. Brutus.

C

C. Caius, Colonia.
C. A. Cæſarea Auguſta.
C. CAE. or CAES. Cæſar.
CAESS. Cæſares.
CARTH. Carthage.
CEN. Cenſor.
CENS. P. Cenſor Perpetuus.
CEST. Ceſtius, or Ceſtianus.
CIR. CON. Circum Condidit, or Circenſes Conceſſit.
CIVIB. ET SIGN. MILIT. A. PARTH. RECVP. Civibus et Signis Militaribus a Parthis Recuperatis.
CN. Cneius.
COEL. Cœlius.
CON. OB. Conſtantinopoli Obſignata, or Conſtantinopoli Officina ſecunda, or Conflata Obryzo.
COL. Colonia.
CON. SVO. Conſervatori ſuo.
CONCORD. Concordia.
CL. V. Clypeus Votivus.
COMM. Commodus.
CLOD. Clodius.
CL. or CLAVD. Claudius.
COS. Conſul.
COSS. Conſules.
CORN. Cornelius.
CVR. X. F. Curavit Denarium Faciendum.

D

D. Decimus, Divus, Deſignatus.
DAC. Dacicus.
D. F. Dacia felix.
D. M. Diis Manibus.
DES. or DESIG. Deſignatus.
DICT. Dictator.
DOMIT. Domitianus.
D. N. Dominus noſter.
DID. Didius.
D. P. Dii Penates.
DV. Divus.

E

EID. MAR. Idus Martiæ.
EX. CONS. D. Ex Conſenſu Decuriorum.
EX. S. C. Ex Senatus Conſulto.
EQ. ORDIN. Equeſtris Ordinis.
EX. A. PV. Ex Argento, or Auctoritate Publica.
EXER. Exercitus.
ETR. Etruſcus.

F

F. Filius, or Filia, or Felix, or Faciundum, or Fecit.
FEL. Felix.
FELIC. Felicitas.
FL. Flavius.
FLAM. Flamen.
FORT. RED. Fortunæ Reduci.
FOVRI. Fourius for Furius.
FONT. Fonteius.
FRVGIF. Frugiferæ (Cereri).
FVL. Fulvius.
FVLG. Fulgerator.

G

G. Gneius, Genius, Gaudium.
GA. Gaditanus.
G. D. Germanicus Dacicus.
GEN. Genius.
GERM. Germanicus.
GL. E. R. Gloria Exercitus Romani.
GL. P. R. Gloria Populi Romani.
GOTH. Gothicus.
G. P. R. Genio Populi Romani.
G. T. A. Genius Tutelaris Ægypti, or Africæ.

H

HEL. Helvius.
HEL. Heliopolis.
HER. Herennius, or Herennia.
HO. Honos.
HS. Seſtertius.

I

I. Imperator, Jovi, Julius.
IAN. CLV. Janum cluſit for clauſit.
IMP. Imperator.
IMPP. Imperatores.
I. S. M. R. Juno Soſpita, Mater or Magna Regina.
IT. Italia, Iterum.
ITE. Iterum.
IVL. Julius or Julia.
IVST. Juſtus.
I-I. S. Seſtertius.
I. O. M. SACR. Jovi Optimo, Maximo, Sacrum.
II. VIR. Duumvir.
III. VIR. R. P. C. Triumvir Reipublicæ Conſtituendæ.
IIII. VIR. A. P. F. Quatuorvir, or Quatuorviri, Auro, or Argento, or Ære, Publico Feriundo.
IVN. Junior.

L

L. Lucius.
LAT. Latinus.
LEG. PROPR. Legatus Proprætoris.
LEG. I. &c. Legio Prima, &c.
LEP. Lepidus.
LENT. CVR. X. F. Lentulus Curavit Denarium Faciundum.
LIBERO P. Libero Patri.
LIB. PVB. Libertas Publica.
LIC. Licinius.
L. S. DEN. Lucius Sicinius Dentatus.
LVC. Lucifera.
LVD. CIR. Ludi Circenſes.
LVD. EQ. Ludi Equeſtres.
LVD. SAEC. F. Ludos Sæculares Fecit.

M

M. Marcus, or Marius.
MAR. CL. Marcellus Clodius.
M. F. Marci Filius.
M. OTACIL. Marcia Otacilia.
MAG. or MAGN. Magnus.
MAC. Macellum.
MAX. Maximus.
MAR. Martia (aqua).
MAR. VLT. Marti Ultori.
MES. Meſſius.
METAL. Metallum.
MINAT. Minatius.
MINER. Minerva.
M. M. I. V. Municipes Municipii Julii Uticenſis.
MON. or MONET. Moneta.

N

N. Nepos or Noſter.
N. C. Nobiliſſimus Cæſar.
NAT. VRB. Natalis Urbis.
NEP. Nepos.
NEP. RED. Neptuno Reduci.

O

O. Optimo.
OB. C. S. Ob Cives Servatos.
OF. Officina.
OPEL. Opelius.
ORB. TERR. Orbis Terrarum.

P

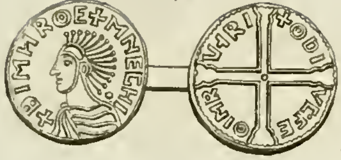
P. or POT. Poteſtate.
PAC. ORB. TER. Pacatori Orbis Terrarum.
PAPI. Papius or Papirius.
PARTH. Parthicus.
PERP. Perpetuus.
PERT. or PERTIN. Pertinax.
PESC. Peſcennius.
P. F. Pius Felix.
PLAET. Plætonius.
P. L. N. Pecunia Londini Notata.
P. LON. S. Pecunia Londini Signata.
P. M. or PONT. MAX. Pontifex Maximus.
POMP. Pompeius.
P. P. Pater Patriæ.
PR. Prætor.
P. R. Populus Romanus.
PRAEF. CLAS. ET. OR. MARIT. Præfectus Claſſis et Oræ Maritimæ.
PRINC. IVVENT. Princeps Juventutis.
PRIV. Privernum.
PROC. Proconſul.
PRON. Pronepos.
PROP. Proprætor.
PROQ. Proquæſtor.
PROV. DEOR. Providentia Deorum.
PVPIEN. Pupienus.

Q

Q. Quintus, or Quæſtor.

A. Bell Prin. Wal. Sculptor fecit.

22.



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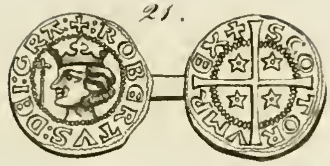

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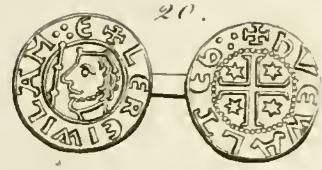

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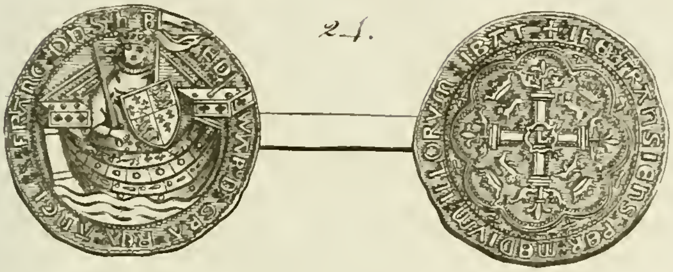

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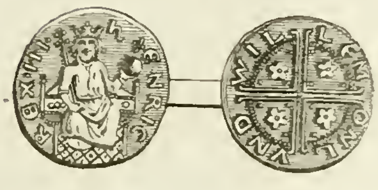

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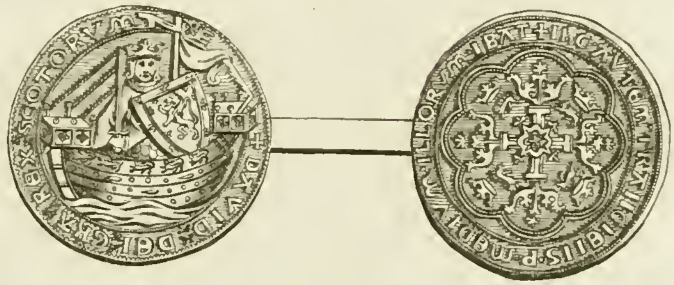

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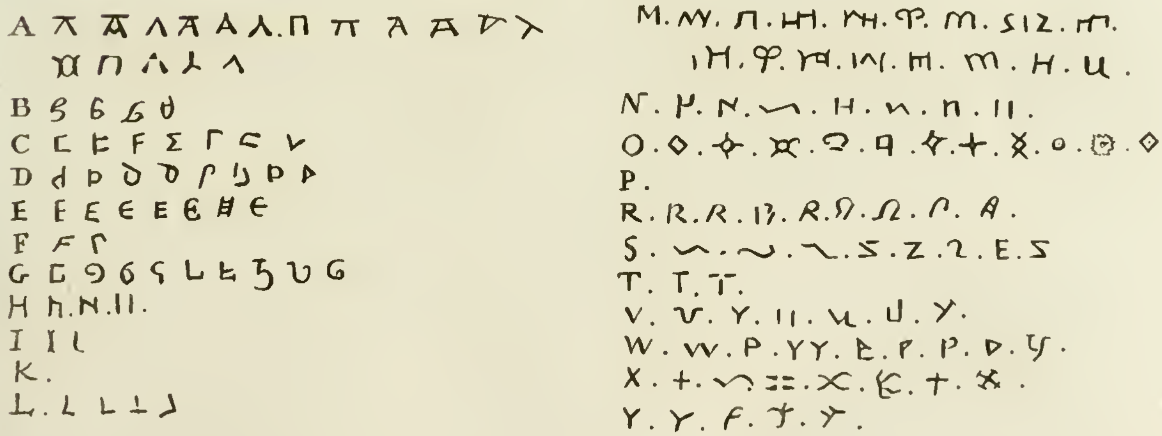

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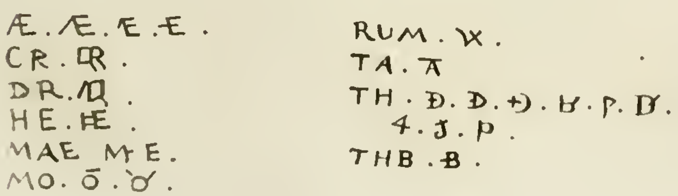

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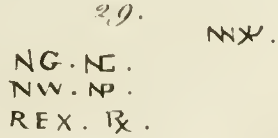

Abbreviations.

Q. C. M. P. I. Quintus Cæcilius Metellus Pius Imperator.
Q. DESIG. Quæstor Designatus.
Q. P. Quæstor Prætorius.
Q. PR. Quæstor Provincialis.

R

R. Roma, Restituit.
RECEP. Receptis, or Receptus.
REST. Restituit.
ROM. ET AVG. Romæ et Augusto.
R. P. Respublica.

S

SAEC. AVR. Sæculum Aureum.
SAEC. FEL. Sæculi Felicitas.
SAL. Salus.
SALL. Sallustia.
SARM. Sarmaticus.
S. C. Senatus Consulto.
SCIP. ASIA. Scipio Asiaticus.
SEC. ORB. Securitas Orbis
SEC. PERP. Securitas Perpetua.
SEC. TEMP. Securitas Temporum.
SEN. Senior.
SEPT. Septimius.
SER. Servius.
SEV. Severus.
SEX. Sextus.
SIC. V. SIC X. Sicut Quinquennalia, sic Decennalia.
SIG. Signis.
S. M. Signata Moneta.
S. P. Q. R. Senatus Populusque Romanus.
STABIL. Stabilita (terra).
SVL. Sulla.

T

T. Titus, Tribunus.
TER. Terentius, or Tertium.
TEMP. Temporum.
TI. Tiberius,
TR. or TREV. Treveris.
TREB. Trebonianus.
TR. MIL. Tribunus Militaris.
TR. P. or TRIB. POT. Tribunicia Potestate.

V

V. Quintum.
V. C. Vir Clarissimus.
VESP. Vespasianus.
VIB. Vibius.
VICT. Victoria.
VII. VIR. EPVL. Septemvir Epulonum.
VIL. PVB. Villa Publica.
VIRT. Virtus.
VN. MR. Venerandæ Memoriæ.
VOT. X. MVLT. XX. Votis Decennalibus Multiplicatis Vicennalibus.

X

X. Decem, Denarius.
XV. VIR. SACR. FAC. Quindecim Vir Sacris Faciundis.

Abbreviations on the Exergue; from Banduri and Monaldini. Pinkerton.

A. Officina Prima.
ALE. Alexandria.
AMB. Antiochensis Moneta Secundæ Officinæ.
AN. ANT. ANTI. Antiochia.
ANB. Antiochiæ Secunda Officina: to ANH. Antiochiæ Octava Officina.
A. P. L. (In officina) Prima percussa Lugduni.
AQ. AQL. Aquileiæ.
AQ. O. B. F. Aquileiæ Officinæ Secundæ Fabrica.
AQ. P. S. Aquileiæ Pecunia Signata.
AQ. S. Aquileiæ Signata.
A. AR. ARL. Arelate.
A. SISC. Prima (in officina) Sisciæ.
B. SIRM. Secunda Sirmii.
B. S. L. C. Secunda Signata Lugduni.
C. Θ. Constantinopoli Nona.
COMOB. Conflata Moneta Obryzo. Only on gold or silver from a gold dye.
CON. Constantinopoli.
CONOB. Conflata Obryzo. Only on gold.
CONS. Constantinopoli.
KART. Carthago.
K. O. Carthaginensis Officina.
L. LC. LVC. LVG. Lucduni, Lugduni.
L. LON. Londini
L. P. Lugdunensis vel Londinensis Pecunia.
LVC. P. S. Lugduni Pecunia Signata.
MDPS Mediolani Pecunia Signata.
M. K. V. T. Moneta Karthaginensis Urbis (in officina) Tertia.
M. L. Moneta Lugdunensis vel Londinensis.
MOSTT. Moneta Officinæ Secundæ Treverorum.
MSTR. Moneta Signata Treveris.
O. Officina.
OFF. III. CONST. Officina Tertia Constantinopoli.
PARL. Percussa or Pecunia Arelate.
PLON. Pecunia Londinensis.
PLVG. Pecunia Lugdunensis.
P. R. Pecunia Romana, or Percussa Romæ.
P. T. Pecunia Treverensis.
Q. AR. Quincta Arelatensis (officina).
R. RO. ROM. Romæ.
RA. Ravennæ.
ROPS. Romæ Pecunia Signata.
S. AR. Signata Arelate.
S. CONST. Signata Constantinopoli.
SIS. Sisciæ.
SS. P. Sisciensis Pecunia.
SISC. V. Siscia Urbs.
SMA. Signata Moneta Antiochiæ.
S. M. HER. Signata Moneta Heracleæ.
S. M. N. Signata Moneta Nicomediæ.
S. M. R. Signata Moneta Romæ.
S. T. Signata Treveris.
TESOB. Tessalonicæ Officina Secunda.
THEOPO. Theopoli.
TR. Treveris.
TROB. Treveris Officina Secunda.

A List of Roman Colonies whose Coins remain; and Abbreviations on these Coins.

Abdera in Spain.
Acci in Spain.
Achulla in Africa.
Ælia Capitolina in Judæa.
Agrippina in Germany.
Antiochia in Pisidia.
in Syria.
Apamea in Bithynia.
Arna in Thessaly.
Astigi in Spain.
Babba in Mauritania Tingitana.
Berytus in Phœnicia.
Bilbilis in Spain.
Bostra in Arabia.
Bracara Augusta in Spain.
Buthrotum in Epirus.
Cabellio in Gaul.
Cæsar-Augusta in Spain.
Cæsarea in Palestine.
Calagurris in Spain.
Calpe in Spain.
Camalodunum in Britain.
Carrhæ in Mesopotamia.
Carteia in Spain.
Carthago in Africa.
Carthago Nova in Spain.
Cascantum in Spain.
Cassandria in Macedon.
Celsa in Spain.
Clunia in Spain.
Coillu in Numidia.
Comana in Cappadocia.
Corinthus in Greece.
Cremna in Pisidia.
Culla in Thrace.
Damascus in Celesyria.
Dertosa in Spain.
Deulton in Thrace.
Dium in Macedon.
Ebora in Spain.
Edessa in Mesopotamia.
Emerita in Spain.
Emesa in Phœnicia.
Ergavica in Spain.
Germe in Galatia.
Graccuris in Spain.
Hadrumetum in Africa.
Heliopolis in Celesyria.
Hippo Regius in Africa.
Iconium in Lycaonia.
Ilerda in Spain.
Illergavonia in Spain.
Illeci in Spain.
Iol in Mauritania.
Italica in Spain.
Laelia in Spain.
Laodicea in Syria
Leptis in Africa.
Lugdunum in Gaul.
Neapolis in Palestine.
Nemausus in Gaul.
Nesibis in Mesopotamia.
Norba Cæsarea in Mauritanica.
Obulco in Spain
Oea in Africa.
Olba in Pamphylia.
Osca in Spain.
Osicarda in Spain.
Panormus in Sicily.
Parium in Mysia.

Parlaïs

Abbreviations.

Parlais in Lycaonia.
Patricia (Corduba) in Spain.
Pella in Macedon.
Philippi in Macedon.
Philippopolis in Arabia.
Ptolemais in Phœnicia.
Rufcino in Gaul.
Romula (Hifpalis) in Spain.
Rhefæna in Mefopotamia.
Sabaria in Hungary.
Saguntum in Spain.
Sebafte in Paleftine.
Segobriga in Spain.
Sidon in Phœnicia.
Singara in Mefopotamia.
Sinope in Pontus.
Stobi in Macedon.
Tarraco in Spain.
Theffalonica in Macedon.
Traducta (Julia) in Spain.
Troas in Phrygia.
Turiafo in Spain.
Tyana in Cappadocia.
Tyrus in Phœnicia.
Valentia in Spain.
Vienna in Gaul.
Viminacium in Mœfia.
Utica in Africa.

Abbreviations on Colonial Coins.

ACCI. Accitana Colonia, *Guadix in Spain.*
ADI. Adjutrix *legio.*
AEL. MVN. COEL. Ælium Municipium Cœla, *near Seftos on the Hellefpont.*
AST. Aftigitana, *Eceja* in Andalufia.
B. A. Braccara Augufti, *Brague in Portugal.*
C. A. Cæfaria Antiochiæ.
C. A. A. P. or PATR. Colonia Augufta Aroe Patrenfis.
CAB. Cabellio.
C. A. BVT. Colonia Augufti Buthrotum, *in Epirus.*
C. A. C. Colonia Augufta Cæfarea.
C. A. I. Colonia Augufta Julia, *Cadiz.*
C. A. E. Colonia Aug. Emerita, *Merida.*
CAL. Calagurris, *Calaborra in Spain.*
C. A. O. A. F. Colonia Antoniana Oea Aug. Felix, *Tripoli in Africa.*
C. A. PI. MET. SID. Colonia Amelia Pia Metropolis Sidon.
C. A. R. Colonia Augufta Rauracorum, or Colonia Afta Regia: Augft in Switzerland, or Aft near Xeres de la Frontera in Spain.
C. C. A. Colonia Cæfarea Augufta, *Saragoffa in Spain.*
C. C. COL. LUG. Claudia Copia Colonia Lugdunenfis.
C. C. I. B. Colonia Campeftris Julia Babba, *in Mauritania.*
C. C. I. B. D. D. Colonia Campeftris Julia Babba, Decreto Decurionum.
C. C. I. H. P. A. Colonia Concordia Julia, Hadrumetina, Pia Augufta.
C. CIV. D. D. P. Corona Civica data Decreto Publico.
C. C. N. A. Colonia Carthago Nova Augufta
C. C. N. C. D. D. Colonia Concordia, Norba Cæfareana, Decreto Decurionum.
C. COR. Colonia Corinthus.
C. C. T. Ducentefima Remiffa.
C. C. S. Colonia Claudia Sabaria, *in Hungary.*
C. F. P. D. Colonia Flavia Pacenfis Develtum, *Develtum in Thrace.*
C. G. I. H. P. A. Colonia Gemella Julia Hadriana, Pariana, Augufta.
C. I. C. A. Colonia Julia Concordia, Apamea.
C. I. A. D. Colonia Julia Augufta Dertona, *Tortona near Milan.*
C. I. AV. Colonia Julia Aug. *Cadiz.*
C. I. AVG. F. SIN. Colonia Julia Augufta Felix Sinope.
C. I. B. Colonia Julia Balba, *in Mauritania.*
C. I. C. A. P. A. Colonia Julia Carthago Augufta Pia Antiqua, or Corinth, or Carthago Nova.
C. I. CAL. Colonia Julia Calpe, *Gibraltar.*
C. I. F. Colonia Julia Felix, *Cadiz*
C. I. G. A. Colonia Julia Gemella (c) Augufta.
C. I. I. A. Colonia Immunis Illice Augufta, *Elche in Spain.*
C. I. N. C. Colonia Julia Norba Cæfareana, or Alcantara: fometimes it means Col. Julia Nova Carthago.
C. I. V. Colonia Julia Valentia, *Valencia in Spain.*
C. V. T. Colonia Victrix Tarraco.
C. L. I. COR. Colonia Laus Julia Corinthus.
C. L. I. N. AVG. Colonia Laus Julia Nova Augufta, *Laus or Lodi in Lucania.*
C. M. L. Colonia Metropolis Laodicea, *in Cœlefyria.*
CO. DAM. METRO. Colonia Damafcus Metropolis.
COHH. PRET. VII. P. VI F. Cohortes Prætorianæ Septimum Piæ, Sextum Felices.
COH. I. CR Cohors prima Cretenfis.
COH. PRET PHIL. Cohors Prætoriana Philippenfium.
COL. AEL. A H MET. Colonia Ælia Augufta Hadrumetina Metropolis. *in Africa*
COL. AEL. CAP COMM P F. Colonia Ælia Capitolina Commodiana Pia Felix.
COL. ALEX. TROAS Colonia Alexandriana Troas.
COL. AMAS. or AMS. Colonia Amaftriana, *in Paphlagonia.*
COL. ANT. *Antioch in Pifidia.*
COL. ARELAT. SEXTAN. Colonia Arelate Sextanorum, *Arles.*
COL. AST. AVG. Colonia Aftigitana Augufta, *Eceja in Spain.*
COL. AVG. FEL. BER. Colonia Augufta Felix Berytus.
COL. AVG. FIR. Colonia Aug. firma, *Eceja.*
COL. AVG. IVL. PHILIP. Colonia Augufta Julia Philippenfis.
COL. AVG. PAT. TREVIR. Colonia Augufta Paterna Trevirorum, *Treves in Germany, fent from Paternum in Italy.*
COL. AVR. KAR. COMM P. F. Colonia Aurelia Karrhæ Commodiana Pia Felix, or Carneatum Commagene, or *Carrhæ in Afia.*
COL. B. A. Colonia Braccara Augufta, *Brague.*
COL. BRYT. L. V. Colonia Berytus Legio Quinta.
COL. CABE. Colonia Cabellio.
COL. CAES. AVG. Colonia Cæfarea Augufta, *in Paleftine.*
COL. CAMALODVN. Colonia Camalodunum, *England.*
COL. CASILIN. Colonia Cafilinum, *Caftellazo in Italy.*
COL. CL. PTOL. Colonia Claudia Ptolemais, *Acre in Phœnicia*
COL. DAMAS METRO. Colonia Damafcus Metropolis.
COL. F. I. A P. BARCIN. Colonia Flavia Julia Augufta Pia, Barcino *or Barcelona.*
COL. FL. PAC. DEVLT. Colonia Flavia Pacenfis Deultum, *Deultum in Thrace*
COL. HA. ME. T. Colonia Hadriana Mercurialis Thænitana, Mercuriali, *Fermo in Italy, and Thenes in Africa.*
COL. H. (OR HEL.) LEG. H. Colonia Heliopolis Legio Heliopolitana.
COL. HEL. I O. M. H. Colonia Heliopolis Jovi Optimo Maximo Heliopolitano.
COL. IVL. AVG. C I. F. COMAN. Colonia Julia Augufta Concordia Invicta Felix Comanorum, *drawn from Con-*

(c) Gemella implies a colony drawn from two others.

Abbreviations.

Concordia in Italy, and sent to Comana in Cappadocia.

COL. IVL. AVG. FEL. CREMNA. Colonia Julia Augusta Felix Cremna, *in Pamphylia.*

COL. IVL. CER. SAC. AVG. FEL. CAP. OECVM. ISE. HEL. Colonia Julia Certamen Sacrum Augustum Felix Capitolinum Oecumenicum Iselasticum Heliopolitanum.

COL. IVL. CONC. APAM. AVG. D. D. Colonia Julia Concordia Apamea Augusta Decreto Decurionum.

COL. IVL. PATER. NAR. Colonia Julia Paterna Narbonensis.

COL. NEM. Colonia Nemausus.

COL. NICEPH. COND. Colonia Nicephorium Condita, *in Mesopotamia.*

COL. PATR. Colonia Patrensis *or* Patricia, *Patras in Greece,* or *Cordova in Spain.*

COL. P. F. AVG. F. CAES. MET. Colonia Prima Flavia Aug. Felix Cæsarea Metropolis, *in Palestine.*

COL. P. FL. AVG. CAES METROP P. S. P. *same as above,* P. S. P. *is* Provinciæ Syriæ Palestinæ.

COL. PR. F. A. CAESAR. Colonia Prima Flavia Augusta Cæsarea, *in Palestine.*

COL. R. F. AVG. FL. C. METROP. Colonia Romana Felix Aug. Flavia Cæsarea Metropolis *The same.*

COL. ROM. Colonia Romulea, or *Seville.*

COL. ROM. LVG. Colonia Romana Lugdunum.

COL RVS. LEG VI Colonia Ruscino Legio Sexta, *Roussillon in France.*

COL. SABAR. Colonia Saburiæ.

COL. SABAS. Sebaste *in Palestine.*

COL. SER. G. NEAPOL Colonia Servii Galbæ Neapolis, *in Palestine.*

COL. V I. CELSA, or COL. VIC. IVL. CELSA. Colonia Victrix Julia Celsa, *Kelsa in Spain.*

COL. VIC. IVL. LEP. Colonia Victrix Julia Leptis, *in Africa.*

COL. VIM AN. I. or II, &c. Colonia Viminacium Anno primo, *Widin in Servia.*

COL. VLP. TRA. Colonia Ulpia Trajana: *Kellen,* or *Warhal in Transilvania.*

CO P F COE. METRO. Colonia Prima Flavia Cæsarea Metropolis.

CO. P I A. Colonia Pacensis Julia Augusta, *or* Col. Octaviana.

C. R. I F. S. Colonia Romana Julia Felix Sinope.

C. T. T. Colonia Togata Tarraco.

C V. IL. Colonia Victrix Illice, *Elche in Spain.*

D. Decuriones.

D. C. A. Divus Cæs. Aug.

DERT. Dertosa.

GEN. COL. NER. PATR. Genio Coloniæ Neronianæ Patrensis.

G. L. S. Genio Loci Sacrum.

M. H. ILLERGAVONIA DERT. Municipium Hibera Illergavonia Dertosa, *Tortosa in Catalonia.*

M. M. I. V. Municipes Municipii Julii Uticensis.

M. R. Municipium Ravennatium.

MVN. CAL. IVL. Municipium Calagurris Julia, *in Spain.*

MVN. CLVN. Municipium Clunia, *Crunna in Spain.*

MVN. FANE. ÆL. Municipium Fanestre Aelium. *Fano.*

MVN. STOB. Municipium Stobense, *Sobi in Macedon.*

MV. TV. Municipium Turiaso, *in Spain.*

N. TR. ALEXANDRIANAE COL. BOSTR. Nerviæ Trojanæ Alexandrianæ Coloniæ Bostræ, *in Palestine.*

SEP. COL. LAVD. Septimia Colonia Laudicea, *or* Laodicea.

SEP. TYR. MET. Septima Tyrus Metropolis.

Explanation of Plates.

Explanation of the Plates.

Plates CCXCII. and CCXCIII.

Fig. 1. A Persian Daric.
2. A drachm of Egina.
3. A silver hemidrachm of Alexander the Great.
4. Tigranes the younger of Armenia, with his sister.
5. One of the coins of the Arsacidæ of Parthia.
6. A coin of the Sassanidæ of Persia. First published by Mr Pinkerton.
7. Denarius of Cneius Pompey from Mr Pinkerton, reverse. Received by Spain.
8. A brass coin of Cunobelinus.
9. Pescennius Niger. Struck at Antioch; unique. In Dr Hunter's cabinet; published by Mr Pinkerton.
10. A silver coin of Carausius.
11. Reverse of Claudius in first brass.
12. Reverse of Adrian.
13. Of Antoninus Pius.
14. Of Commodus.
15. Of Severus.
16. A Saxon penny.
17. A Saxon styca.
18. 19. Ancient pennies, supposed to be Scottish.
20. A penny of William of Scotland.
21. A penny of Robert the Great.
22. An Irish penny.
23. The gold penny of Henry III.
24. The large noble of the first coinage of Edward III.
25. The gold medal of David II. of Scotland.
26. The ryal of Queen Mary of Scotland.
27. Letters on Anglo-Saxon coins.
28. Abbreviations on ditto.
29. Monetarius.

Impressions of MEDALS. See CASTING.

Medallion.

MEDALLION, or MEDALION, a medal of an extraordinary size, supposed to be anciently struck by the emperors for their friends, and for foreign princes and ambassadors. But, that the smallness of their number might not endanger the loss of the devices they bore, the Romans generally took care to stamp the subject of them upon their ordinary coins.

Medallions, in respect of the other coins, were the same as modern medals in respect of modern money: they were exempted from all commerce, and had no other value than what was set upon them by the fancy of the owner. Medallions are so scarce, that there cannot be any set made of them, even though the metals and sizes should be mixed promiscuously.

Mede.

MEDE (Joseph), a very learned English divine of the 17th century, was educated at Cambridge, and soon distinguished himself to great advantage; for by the time he had taken the degree of master of arts in 1610, he had made an uncommon progress in all academical studies. His first appearance as a writer was by an address to Dr Andrews, then bishop of Ely, in

Mede. a Latin tract *De Sanctitate Relativa*, which was highly approved of by that prelate, who desired him to be his domestic chaplain. This Mr Mede very civilly refused; valuing the liberty of his studies above any hopes of preferment, and esteeming that freedom which he enjoyed in his cell, so he used to call it, as the haven of all his wishes And indeed these thoughts had possessed him betimes; for when he was a school-boy, he was sent to by his uncle, Mr Richard Mede, a merchant, who, being then without children, offered to adopt him for his son if he would live with him: but he refused the offer, preferring, as it should seem, a life of study to a life of gain.

He was not chosen fellow of his college 'till after he was master of arts, and then not without the assistance of his friend bishop Andrews: for he had been passed over at several elections, on account of a causeless suspicion which Dr Cary, then master of the college, afterwards bishop of Exeter, had conceived of him, that "he looked too much towards Geneva." Being made fellow, he became an eminent and faithful tutor. After he had well grounded his pupils in humanity, logic, and philosophy, so that they were able to walk as it were alone, he used to set every one his daily task; which he rather chose, than to confine himself and them to precise hours for lectures. In the evening they all came to his chamber; and the first question he put to each was, *Quid dubitas?* "What doubts have you met with in your studies to-day?" For he supposed, that to doubt nothing and to understand nothing was just the same thing. This was right, and the best method to make young men exercise their rational powers, and not acquiesce in what they learn mechanically, and by rote, with an indolence of spirit which prepares them to receive and swallow implicitly whatever is offered to them. As to himself, he was so entirely devoted to the study of all excellent knowledge, that he made even the time he spent in his amusements serviceable to his purpose. He allowed himself little no exercise but walking; and often, in the fields or college garden, would take occasion to speak of the beauty, signatures, virtues, or properties of the plants then in view. for he was a curious florist, an accurate herbalist, and thoroughly versed in the book of nature. The chief delight he took in company was to discourse with learned friends.

Mr Mede was a curious inquirer into the most abstruse parts of learning, and endeavoured after the knowledge of those things which were most remote from the vulgar track. Among other things, he spent no small pains and time in sounding the depths of astrology, and blotted much paper in calculating the nativities of his near relations and fellow-students: but this was in his younger years, and he afterwards discovered the vanity and weakness of this fanciful art. He applied himself to the more useful study of history and antiquities; particularly to those mysterious sciences which made the ancient Chaldeans, Egyptians, and other nations, so famous; tracing them as far as he could have any light to guide him in their oriental schemes and figurative expressions, as likewise in their hieroglyphics, not forgetting to inquire also into the oneirocritics of the ancients: which he did the rather, because of that affinity he conceived they might have with the language of the prophets. He was a curious and laborious searcher of antiquities relating to religion, ethnic, Jewish, Christian, and Mahometan: to which he added other attendants, necessary for understanding the more difficult parts of Scripture.

In 1620, he refused the provostship of Trinity-college, Dublin, into which he had been elected at the recommendation of archbishop Usher, who was his particular friend; as he did also when it was offered to him a second time, in 1630. The height of his ambition was, only to have had some small donative sinecure added to his fellowship, or to have been thrown into some place of quiet; where, retired from the noise and tumults of the world, and possessed of a competency of fortune, he might have been entirely at leisure for study and acts of piety. In the mean time, although his circumstances were scanty, for he had nothing but his fellowship and a college lecture, his charity was diffusive and uncommon; and, strange as it may now seem, he devoted the tenth of his income to pious and charitable uses. But his frugality and temperance always afforded him plenty. His prudence or moderation, either in declaring or defending his private opinions, was very remarkable; as was also his freedom from partiality, prejudice or prepossession, pride, anger, selfishness, flattery, and ambition. He was meek, patient, equally remote from superstition and licentiousness of thinking; and, in short, possessed every virtue. This great and good man died in 163[illegible], in his [illegible]2d year, having spent above two-thirds of his time in college.

Medea. MEDEA, in fabulous history, a celebrated sorceress, daughter of Æetes king of Colchis. Her mother's name, according to the more received opinion of Hesiod and Hyginus, was Idyia, or, according to others, Ephyre, Hecate, Asterodia, Antiope, and Neæra. She was the niece of Circe. When Jason came to Colchis in quest of the golden fleece, Medea became enamoured of him, and it was to her well-directed labours that the Argonauts owed their preservation. Medea had an interview with her lover in the temple of Hecate; where they bound themselves by the most solemn oaths to eternal fidelity. No sooner had Jason overcome all the difficulties which Æetes had placed in his way, than Medea embarked with the conquerors for Greece. To stop the pursuit of her father, she tore to pieces her brother Absyrtus, and left his mangled limbs in the way through which Æetes was to pass. This act of barbarity, some have attributed to Jason, and not to her. When Jason reached Iolchos his native country, the return and victories of the Argonauts were celebrated with universal rejoicings; but Æson the father of Jason was unable to assist at the solemnity on account of the infirmities of his age. Medea, at her husband's request, removed the weakness of Æson; and by drawing away the blood from his veins, and filling them again with the juice of certain herbs, she restored him to the vigour and sprightliness of youth. This sudden change in Æson astonished the inhabitants of Iolchos; and the daughters of Pelias were also desirous to see their father restored by the same power to the vigour of youth. Medea, willing to revenge the injuries which her husband's family had suffered from Pelias, increased their curiosity; and betrayed them into the murder of their father

ther as preparatory to his rejuvenefcence, which fhe afterwards refufed to accomplifh. This action greatly irritated the people of Iolchos; and Medea with her hufband fled to Corinth to avoid their refentment. Here they lived for 10 years with mutual attachment, when the love of Jafon for Glauce the king's daughter interrupted their harmony, and Medea was divorced. Medea revenged the infidelity of Jafon, by caufing the death of Glauce, and the deftruction of her family. She alfo killed two of her children in their father's prefence; and when Jafon attempted to punifh the barbarity of the mother, fhe fled through the air upon a chariot drawn by winged dragons. From Corinth Medea came to Athens, where, after fhe had undergone the neceffary purification of her murder, fhe married king Ægeus, or (according to others) lived in an adulterous manner with him. From her conduct with Ægeus, Medea had a fon who was called *Medus*. Soon after, when Thefeus wifhed to make himfelf known to his father, Medea, jealous of his fame and fearful of his power, attempted to poifon him at a feaft which had been prepared for his entertainment. Her attempts, however, failed of fuccefs, and the fight of the fword which Thefeus wore by his fide convinced Ægeus that the ftranger againft whofe life he had fo bafely confpired was his own fon. The father and the fon were reconciled; and Medea, to avoid the punifhment which her wickednefs deferved, mounted her fiery chariot and difappeared through the air. She came to Colchis; where, according to fome, fhe was reconciled to Jafon, who had fought her in her native country after her fudden departure from Corinth. She died at Colchis, as Juftin mentions, when fhe had been reftored to the confidence of her family. After death fhe married Achilles in the Elyfian fields, according to the traditions mentioned by Simonides. The murder of Mermerus and Pheres, the youngeft of Jafon's children by Medea, is not to be attributed to the mother, according to Elian; but to the Corinthians, who affaffinated them in the temple of Juno Acræa. To avoid the refentment of the gods, and to deliver themfelves from the peftilence which vifited their country after fo horrid a maffacre, they engaged the poet Euripides for five talents to write a tragedy, which cleared them of the murder, and reprefented Medea as the cruel affaffin of her own children. And befides, that this opinion might be the better credited, feftivals were appointed, in which the mother was reprefented with all the barbarity of a fury murdering her own fons.

MEDEOLA, CLIMBING AFRICAN ASPARAGUS, in botany: A genus of the hexandria order, belonging to the trigynia clafs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. There is no calyx; the corolla is fexpartite and revoluted; the berry trifpermous. Its characters are thefe: The flower has no empalement; it has fix oblong oval petals, and fix awl-fhaped ftamina terminated by incumbent fummits; and three horned germina terminating the ftyle; the germina afterward turn to a roundifh trifid berry with three cells, each containing one heart-fhaped feed. There are two fpecies.

MEDIA, now the province of GHILAN in Perfia, once the feat of a potent empire, was bounded, according to Ptolemy, on the north by part of the Cafpian Sea; on the fouth by Perfis, Sufiana, and Affyria; on the eaft by Parthia and Hyrcania; and on the weft by Armenia Major. It was anciently divided into feveral provinces, *viz*. Tropatene, Charomithrene, Darites, Marciane, Amariace, and Syro-Media. By a later divifion, however, all thefe were reduced to two; the one called *Media Magna*, the other *Media Atropatia*, or fimply *Atropatene*. Media Magna was bounded by Perfis, Parthia, Hyrcania, the Hyrcanian Sea, and Atropatene, and contained the cities of Ecbatan, Laodicea, Apamea, Raga, Rageia or Ragea, &c. Atropatene lay between the Cafpian mountains and the Cafpian Sea.

This country originally took its name from Madai, the third fon of Japhet; as is plain from Scripture, where the Medes are conftantly called *Madai*. Among profane authors, fome derive the name *Media*, from one Medus the fon of Jafon and Medea; others from a city called *Media*. Sextus Rufus tells us that in his time it was called *Medena*, and from others we learn that it was alfo called *Aria*. The moft probable hiftory of the Medes is as follows.

This people lived in fubjection to the Affyrians till the reign of Sennacherib, when they threw off the yoke, and lived for fome time in a ftate of anarchy. But at laft, rapine and violence, the natural confequences of fuch a fituation, prevailed fo much that they were conftrained to have recourfe to fome kind of government, that they might be enabled to live in fafety. Accordingly, about 699 B. C. one Dejoces having procured himfelf to be chofen king, united the fcattered tribes into which the Medes were at that time divided; and having applied himfelf as much as poffible to the civilization of his barbarous fubjects, left the throne to his fon Phraortes, after a reign of 53 years.

The new king, who was of a warlike and enterprifing difpofition, fubdued almoft all the Upper Afia lying between Mount Taurus and the river Halys which runs through Cappadocia into the Euxine Sea. Elated with this good fuccefs, he invaded Affyria, the empire of which was now much declined, and greatly weakened by the revolt of many nations which had followed the example of the Medes. Nebuchodonofor or Chyniladan, however, the reigning prince, having affembled what forces he could, engaged Phraortes, defeated, took him prifoner, and put him to death; after which, entering Media, he laid wafte the country, took the metropolis of Ecbatan itfelf, and levelled it with the ground.

On the death of Phraortes, his fon Cyaxares was placed on the throne. He was no lefs valiant and enterprifing than his father, and had better fuccefs againft the Affyrians. With the remains of that army which had been defeated under his father, he not only drove the conquerors out of Media, but obliged Chyniladan to fhut himfelf up in Nineveh. To this place he immediately laid clofe fiege; but was obliged to give over the enterprize on account of an irruption of the Scythians into his own country. Cyaxares engaged thefe new enemies with great refolution; but was utterly defeated; and the conquerors over-ran not only all Media, but the greateft part of Upper Afia, extending their conquefts into Syria, and as far as the confines of Egypt. They continued mafters of all this vaft tract of country for 28 years, till at last Media was delivered from their yoke by a general massacre at the instigation of Cyaxares.

After this deliverance, the Medes soon repossessed themselves of the territories they had lost; and once more extended their frontiers to the river Halys, their ancient boundary to the westward. After this we find the Medes engaged in a war with the Lydians; which, however, ended without any remarkable transaction: but on the conclusion of it, Cyaxares having entered into a strict alliance with Nebuchadnezzar king of Babylon, returned in conjunction with the Babylonians before Nineveh; which they took and levelled with the ground, putting most of the inhabitants to the sword.

After this victory the Babylonian and Median empires seem to have been united: however, after, the death of Nebuchadnezzar, or rather in his lifetime, a war ensued, which was not extinguished but by the dissolution of the Babylonian empire. The Medes, under Astyages the son of Cyaxares I. withstood the power of the Babylonian monarchs; and under Cyrus and Cyaxares II. utterly destroyed their empire by the taking of BABYLON, as is related under that article. After the death of Cyaxares, the kingdom fell to Cyrus, by whom the seat of the empire was transferred to PERSIA, under which article the history of Media now falls to be considered, as also the manners, &c. of the inhabitants.

MEDIANA, the name of a vein or little vessel, made by the union of the cephalic and basilic, in the bend of the elbow.

MEDIASTINUM, in anatomy, a double membrane, formed by a duplicature of the pleura; serving to divide the thorax and the lungs into two parts, and to sustain the viscera, and prevent their falling from one side of the thorax to the other. See ANATOMY, n° 117.

MEDIATE, or INTERMEDIATE, something that stands betwixt and connects two or more terms considered as extremes; in which sense it stands opposed to *immediate*.

MEDIATOR, a person that manages or transacts between two parties at variance in order to reconcile them. The word, in Scripture, is applied, 1. To Jesus Christ, who is the only intercessor and peace-maker between God and man, (1 Tim. ii. 5.) 2. To Moses, who interposed between the Lord and his people, to declare unto them his word; (Deut. v. 5. iii. 19.)

MEDICAGO, SNAIL-TREFOIL, in botany: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The legumen is compressed and screwed; the carina of the corolla luring down from the vexillum. There are nine species, though only five are commonly cultivated in this country. They are low trailing plants, adorned with small yellow flowers, succeeded by small, round, snail-shaped fruit, which are downy, and armed with a few short spines. They are all easily propagated by seeds. For the properties and culture of LUCERN, a species of this genus, see AGRICULTURE, n° 183.

MEDICINAL, any thing belonging to medicine.

MEDICINAL Springs, a general name for any fountain, the waters of which are of use for removing certain disorders. They are commonly either chalybeate or sulphureous. See SPRINGS and WATER.

MEDICINE.

MEDICINE is the art of preventing, curing, or alleviating, those diseases to which the human species are subjected.

History of Medicine.

1 Origin of medicine among the Jews;

THE fabulous history of the ancients derives this art immediately from their gods; and, even among the moderns, some are of opinion that it may justly be considered as of divine revelation. But without adopting any supposition of which no probable evidence can be given, we may conclude that mankind were naturally led to it from casual observations on the diseases to which they found themselves subjected; and that therefore, in one sense at least, it is as ancient as the human race. But at what period it began to be practised as an art, by particular individuals following it as a profession, is not known. The most ancient physicians we read of were those who embalmed the patriarch Jacob by order of his son Joseph. The sacred writer styles these physicians *servants* to Joseph: whence we may be assured that they were not *priests*, as the first physicians are generally supposed to have been; for in that age we know the Egyptian priests were in such high favour, that they retained their liberty, when, through a public calamity, all the rest of the people were made slaves to the prince.

It is not probable, therefore, that among the Egyptians religion and medicine were originally conjoined; and if we suppose the Jews not to have invented the art, but received it from some other nation, it is as little probable that the priests of that nation were their physicians as those of Egypt.

That the Jewish physicians were absolutely distinct from their priests, is very certain. Yet as the Jews resided for such a long time in Egypt, it is probable they would retain many of the Egyptian customs, from which it would be very difficult to free them. We read, however, that when king Asa was diseased in his feet, "he sought not to the Lord, but to the physicians." Hence we may conclude, that among the Jews the medicinal art was looked upon as a mere human invention; and it was thought that the Deity never cured diseases by making people acquainted with the virtues of this or that herb, but only by his miraculous power. That the same opinion prevailed among the heathens who were neighbours to the Jews, is also probable from what we read of Ahaziah king of Judah, who having sent messengers to inquire of

Origin of Medicine.

of Baal-zebub god of Ekron concerning his disease, he did not desire any remedy from him or his priests, but simply to know whether he should recover or not.

What seems most probable on this subject therefore is, that religion and medicine came to be mixed together only in consequence of that degeneracy into ignorance and superstition which took place among all nations. The Egyptians, we know, came at last to be sunk in the most ridiculous and absurd superstition; and then, indeed, it is not wonderful to find their priests commencing physicians, and mingling charms, incantations, &c. with their remedies. That this was the case, though long after the days of Joseph, we are very certain; and indeed it seems as natural for ignorance and barbarism to combine religion with physic, as it is for a civilized and enlightened people to keep them separate. Hence we see, that among all modern barbarians their priests or conjurors are their only physicians.

2 Among the Egyptians;

We are so little acquainted with the state of physic among the Egyptians, that it is needless to say much concerning them. They attributed the invention of medicine, as they did also that of many other arts, to Thoth, the Hermes or Mercury of the Greeks. He is said to have written many things in hieroglyphic characters upon certain pillars, in order to perpetuate his knowledge, and render it useful to others. These were transcribed by Agathodemon, or the second Mercury, the father of Tat, who is said to have composed books of them, that were kept in the most sacred places of the Egyptian temples. The existence of such a person, however, is very dubious, and many of the books ascribed to him were accounted forgeries as long ago as the days of Galen; there is also great reason to suspect that those books were written many ages after Hermes, and when physic had made considerable advances. Many of the books attributed to him are trifling and ridiculous; and though sometimes he is allowed to have all the honour of inventing the art, he is on other occasions obliged to share it with Osiris, Isis, and Apis or Serapis.

After all, the Egyptian physic appears to have been little else than a collection of absurd superstitions. Origen informs us, that they believed there were 36 demons, or gods of the air, who divided the human body among them; that they had names for all of them; and that by invoking them according to the part affected, the patient was cured. Of natural medicines we hear of none recommended by the father of Egyptian physic; except the herb *moly*, which he gave to Ulysses in order to secure him from the enchantments of Circe; and the herb *mercury*, of which he first discovered the use. His successors made use of venesection, cathartics, emetics, and clysters. There is no proof, however, that this practice was established by Hermes; on the contrary, the Egyptians themselves pretended that the first hint of those remedies was taken from some observations on brute animals. Venesection was taught them by the hippopotamus, which is said to perform thi operation upon itself. On these occasions, he comes out of the river, and strikes his leg against a sharp-pointed reed. As he takes care to direct the stroke against a vein, the consequence must be a considerable effusion of blood; and this being suffered to run as long as the creature thinks proper, he at last stops up the orifice with mud. The hint of clysters was taken from the ibis, a bird which is said to give itself clysters with its bill, &c. They used venesection, however, but very little, probably on account of the warmth of the climate; and the exhibition of the remedies above mentioned, joined with abstinence, formed the most of their practice.

3 Among the Greeks.

The Greeks too had several persons to whom they attributed the invention of physic, particularly Prometheus, Apollo or Pæan, and Æsculapius; which last was the most celebrated of any. But here we must observe, that as the Greeks were a very warlike people, their physic seems to have been little else than what is now called *surgery*, or the cure of wounds, fractures, &c. Hence Æsculapius, and his pupils Chiron, Machaon, and Podalirius, are celebrated by Homer only for their skill in curing these, without any mention of their attempting the cures of internal diseases. We are not, however, to suppose that they confined themselves entirely to surgery. They no doubt would occasionally prescribe for internal disorders; but as they were most frequently conversant with wounds, we may naturally suppose the greatest part of their skill to have consisted in knowing how to cure these. If we may believe the poets, indeed, the knowledge of medicine seems to have been very generally diffused. Almost all the heroes of antiquity are reported to have been physicians as well as warriors. Most of them were taught physic by the centaur Chiron. From him Hercules received instructions in the medicinal art, in which he is said to have been no less expert than in feats of arms. Several plants were called by his name; whence some think it probable that he found out their virtues, though others are of opinion that they bore the name of this renowned hero on account of their great efficacy in removing diseases. Aristæus king of Arcadia was also one of Chiron's scholars; and is supposed to have discovered the use of the drug called *silphium*, by some thought to be asafætida. Theseus, Telamon, Jason, Peleus, and his son Achilles, were all renowned for their knowledge in the art of physic. The last is said to have discovered the use of verdegrise in cleansing foul ulcers. All of them, however, seem to have been inferior in knowledge to Palamedes, who hindered the plague from coming into the Grecian camp after it had ravaged most of the cities of Hellespont, and even Troy itself. His method was to confine his soldiers to a spare diet, and to oblige them to use much exercise.

The practice of these ancient Greek physicians, notwithstanding the praises bestowed on them by their poets, seems to have been very limited, and in some cases even pernicious. All the external remedies applied to Homer's wounded heroes were fomentations; while inwardly their physicians gave them wine, sometimes mingled with cheese scraped down. A great deal of their physic also consisted in charms, incantations, amulets, &c. of which, as they are common to all superstitious and ignorant nations, it is superfluous to take any farther notice.

In this way the art of medicine continued among the Greeks for many ages. As its first professors knew nothing of the animal œconomy, and as little of the theory of diseases, it is plain, that whatever they did

4 Æſculapius. muſt have been in conſequence of mere random trials, or empiriciſm, in the moſt ſtrict and proper ſenſe of the word. Indeed, it is evidently impoſſible that this or almoſt any other art could originate from another ſource than trials of this kind. Accordingly, we find, that ſome ancient nations were accuſtomed to expoſe their ſick in temples, and by the ſides of highways, that they might receive the advice of every one who paſſed. Among the Greeks, however, Æſculapius was reckoned the moſt eminent practitioner of his time, and his name continued to be revered after his death. He was ranked amongſt the gods; and the principal knowledge of the medicinal art remained with his family to the time of Hippocrates, who reckoned himſelf the ſeventeenth in a lineal deſcent from Æſculapius, and who was truly the firſt who treated of medicine in a regular and rational manner.

5 Hippocrates. Hippocrates, who is ſuppoſed to have lived 400 years before the birth of Chriſt, is the moſt ancient author whoſe writings expreſsly on the ſubject of the medical art are preſerved; and he is therefore juſtly conſidered as the father of phyſic. All the accounts which we have prior to this time, if not evidently fabulous, are at the utmoſt highly conjectural. Even the medical knowledge of Pythagoras, ſo much celebrated as a philoſopher, can hardly be conſidered as reſting on any other foundation. But from the time of Hippocrates, medicine, ſeparated from philoſophy and religion, ſeems to have aſſumed the form of a ſcience, and to have been practiſed as a profeſſion. It may not, therefore, be improper to give a particular account of the ſtate of medical knowledge as tranſmitted to us in his writings. The writings of Hippocrates, however, it may be remarked, are even more than preſerved. Nor is it wonderful that attempts

6 His writings. ſhould have been made to increaſe the value of manuſcripts, by attributing them to a name of ſuch eminence. But although what are tranſmitted to us under the title of his works may have been written by different hands, yet the preſumption is, that moſt, if not all of them, are of nearly as early a date, and contain the prevailing opinions of thoſe times.

According to the moſt authentic accounts, Hippocrates was a native of the iſland of Cos, and born in the beginning of the 88th Olympiad. In the writings tranſmitted to us as his, we find a general principle adopted, to which he gives the name of *Nature*. To this principle he aſcribes a mighty power. "Nature (ſays he) is of itſelf ſufficient to every animal. She performs every thing that is neceſſary to them, without needing the leaſt inſtruction from any one how to do it." Upon this footing, as if Nature had been a principle endowed with knowledge, he gives her the title of *juſt;* and aſcribes virtues or powers to her, which are her ſervants, and by means of which ſhe performs all her operations in the bodies of animals: and diſtributes the blood, ſpirits, and heat, through all parts of the body, which by theſe means receive life and ſenſation. And in other places he tells us, that it is this faculty which gives nouriſhment, preſervation, and growth, to all things.

7 His idea of nature. The manner in which nature acts, or commands her ſubſervient power to act, is by attracting what is good and agreeable to each ſpecies, and by retaining, preparing, and changing it; and on the other ſide in rejecting whatever is ſuperfluous or hurtful, after ſhe has ſeparated it from the good. This is the foundation of the doctrine of depuration, concoction, and criſis in fevers, ſo much inſiſted upon by Hippocrates and moſt other phyſicians. He ſuppoſes alſo, that every thing has an inclination to be joined to what agrees with it, and to remove from every thing contrary to it; and likewiſe that there is an affinity between the ſeveral parts of the body, by which they mutually ſympathize with each other. When he comes to explain what this principle called *nature* is, he is obliged to reſolve it into *heat*, which, he ſays, appears to have ſomething immortal in it.

8 Of the cauſes of diſeaſe. As far as he attempts to explain the cauſes of diſeaſe, he refers much to the humours of the body, particularly to the blood and the bile. He treats alſo of the effects of ſleep, watchings, exerciſe, and reſt, and all the benefit or miſchief we may receive from them. Of all the cauſes of diſeaſes, however, mentioned by Hippocrates, the moſt general are diet and air. On the ſubject of diet he has compoſed ſeveral books, and in the choice of this he was exactly careful; and the more ſo, as his practice turned almoſt wholly upon it. He alſo conſidered the air very much; he examined what winds blew ordinarily or extraordinarily; he conſidered the irregularity of the ſeaſons, the riſing and ſetting of ſtars, or the time of certain conſtellations; alſo the time of the ſolſtices, and of the equinoxes; thoſe days, in his opinion, producing great alterations in certain diſtempers.

9 His diviſions of diſeaſes. He does not, however, pretend to explain how, from theſe cauſes, that variety of diſtempers ariſes which is daily to be obſerved. All that can be gathered from him with regard to this is, that the different cauſes above-mentioned, when applied to the different parts of the body, produce a great variety of diſtempers. Some of theſe diſtempers he accounted *mortal*, others *dangerous*, and the reſt eaſily *curable*, according to the cauſe from whence they ſpring, and the parts on which they fall. In ſeveral places alſo he diſtinguiſhes diſeaſes, from the time of their duration, into *acute* or *ſhort*, and *chronical* or *long*. He likewiſe diſtinguiſhes diſeaſes by the particular places where they prevail, whether ordinary or extraordinary. The firſt, that is, thoſe that are frequent and familiar to certain places, he called *endemic* diſeaſes; and the latter, which ravaged extraordinarily ſometimes in one place, ſometimes in another, which ſeized great numbers at certain times, he called *epidemic*, that is, *popular* diſeaſes; and of this kind the moſt terrible is the plague. He likewiſe mentions a third kind, the oppoſite of the former; and theſe he calls *ſporadic*, or ſtraggling diſeaſes: theſe laſt include all the different ſorts of diſtempers which invade at any one ſeaſon, which are ſometimes of one ſort, and ſometimes of another. He diſtinguiſhed between thoſe diſeaſes which are hereditary, or born with us, and thoſe which are contracted afterwards; and likewiſe between thoſe of a *kindly* and ſuch as are of a *malignant* nature, the former of which are eaſily and frequently cured, but the latter give the phyſicians a great deal of trouble, and are ſeldom overcome by all their care.

Hippocrates remarked four ſtages in diſtempers; viz.

Hippocrates.

viz. the beginning of the diſeaſe, its augmentation, its ſtate or height, and its declination. In ſuch diſeaſes as terminate fatally, death comes in place of the declination. In the third ſtage, therefore, the change is moſt conſiderable, as it determines the fate of the ſick perſon; and this is moſt commonly done by means of a *criſis*. By this word he underſtood any ſudden change in ſickneſs, whether for the better or for the worſe, whether health or death ſucceed immediately. Such a change, he ſays, is made at that time by *nature*, either abſolving or condemning the patient. Hence we may conclude, that Hippocrates imagined diſeaſes to be only a diſturbance of the animal economy, with which Nature was perpetually at variance, and uſing her utmoſt endeavours to expel the offending cauſe. Her manner of acting on theſe occaſions is to reduce to their natural ſtate thoſe humours whoſe diſcord occaſions the diſturbance of the whole body, whether in relation to their quantity, quality, mixture, motion, or any other way in which they become offenſive. The principal means employed by nature for this end is what Hippocrates calls *concoction*.

10
His opinion of a criſis.

By this he underſtood the bringing the morbific matter lodged in the humours to ſuch a ſtate, as to be eaſily fitted for expulſion by whatever means nature might think moſt proper. When matters are brought to this paſs, whatever is ſuperfluous or hurtful immediately empties itſelf, or nature points out to phyſicians the way by which ſuch an evacuation is to be accompliſhed. The criſis takes place either by bleeding, ſtool, vomit, ſweat, urine, tumors or abſceſſes, ſcabs, pimples, ſpots, &c. But theſe evacutions are not to be looked upon as the effects of a true criſis, unleſs they are in conſiderable quantity; ſmall diſcharges not being ſufficient to make a criſis. On the contrary, ſmall diſcharges are a ſign that nature is depreſſed by the load of humours, and that ſhe lets them go thro' weakneſs and continual irritation. What comes forth in this manner is crude, becauſe the diſtemper is yet too ſtrong; and while matters remain in this ſtate, nothing but a bad or imperfect criſis is to be expected. This ſhows that the diſtemper triumphs, or at leaſt is equal in ſtrength to nature, which prognoſticates death, or a prolongation of the diſeaſe. In this laſt caſe, however, nature often has an opportunity of attempting a new criſis more happy than the former, after having made freſh efforts to advance the concoction of the humours.—It muſt here be obſerved, however, that, according to Hippocrates, concoction cannot be made but in a certain time, as every fruit has a limited time to ripen; for he compares the humours which nature has digeſted to fruits come to maturity.

The time required for concoction depends on the differences among diſtempers mentioned above. In thoſe which Hippocrates call *very acute*, the digeſtion or criſis happens by the fourth day; in thoſe which are only *acute*, it happens on the ſeventh, 11th, or 14th day; which laſt is the longeſt period generally allowed by Hippocrates in diſtempers that are truly acute: though in ſome places he ſtretches it to the 20th, or 21ſt, nay, ſometimes to the 40th or 60th days. All diſeaſes that exceed this laſt term are called *chronical*. And while in thoſe diſeaſes that exceed 14 days, he conſiders every fourth day as critical, or at leaſt remarkable, by which we may judge whether the criſis on the following fourth day will be favourable or not; ſo in thoſe which run from 20 to 40 he reckons only the ſevenths, and in thoſe that exceed 40 he begins to reckon by 20. Beyond the 120th he thinks that the number of days has no power over the criſis. They are then referred to the general changes of the ſeaſons; ſome terminating about the equinoxes; others about the ſolſtices; others about the riſing or ſetting of the ſtars of certain conſtellations; or if numbers have yet any place, he reckons by months, or even whole years. Thus (he ſays), certain diſeaſes in children have their criſis in the ſeventh month after their birth, and others in their ſeventh or even their 14th year.

Though Hippocrates mentions the 21ſt as one of the critical days in acute diſtempers, as already noticed; yet, in other places of his works, he mentions alſo the 20th. The reaſon he gives for this in one of thoſe places of his works is, that the days of ſickneſs were not quite entire. In general, however, he is much attached to the odd days: inſomuch that in one of his aphoriſms he tells us, "The ſweats that come out upon the 3d, 5th, 7th, 9th, 11th, 14th, 17th, 21ſt, 27th, 31ſt, or 34th days, are beneficial; but thoſe that come out upon other days ſignify that the ſick ſhall be brought low, that his diſeaſe ſhall be very tedious, and that he ſhall be ſubject to relapſes." He further ſays, "That the fever which leaves the ſick upon any but an odd day is uſually apt to relapſe." Sometimes, however, he confeſſes that it is otherwiſe; and he gives an inſtance of a ſalutary criſis happening on the ſixth day. But theſe are very rare inſtances, and therefore cannot, in his opinion, overthrow the general rule.

Beſides the criſis, however, or the change which determines the fate of the patient, Hippocrates often ſpeaks of another, which only changes the ſpecies of the diſtemper, without reſtoring the patient to health; as when a vertigo is turned to an epilepſy, a tertian fever to a quartan, or to a continual, &c.

11
His accuracy in prognoſtics.

But what has chiefly contributed to procure the vaſt reſpect generally paid to Hippocrates, is his induſtry in obſerving the moſt minute circumſtances of diſeaſes, and his exactneſs in nicely deſcribing every thing that happened before, and every accident that appeared at the ſame time with them; and likewiſe what appeared to give eaſe, and what to increaſe the malady: which is what we call *writing the hiſtory of a diſeaſe*.—Thus he not only diſtinguiſhed one diſeaſe from another by the ſigns which properly belonged to each; but by comparing the ſame ſort of diſtemper which happened to ſeveral perſons, and the accidents which uſually appeared before and after, he could often foretel a diſeaſe before it came, and afterwards give a right judgment of the event of it. By this way of prognoſticating, he came to be exceedingly admired: and this he carried to ſuch a height, that it may juſtly be ſaid to be his maſter-piece; and Celſus, who lived after him, remarks, that ſucceeding phyſicians, though they found out ſeveral new things relating to the management of diſeaſes, yet were obli-

Hippocrates. ged to the writings of Hippocrates for all that they knew of signs.

From the look; The first thing Hippocrates considered, when called to a patient, was his looks. It was a good sign with him to have a visage resembling that of a person in health, and the same with what the sick man had before he was attacked by the disease. As it varied from this, so much the greater danger was apprehended. The following is the description which he gives of the looks of a dying man.—"When a patient (says he) has his nose sharp, his eyes sunk, his temples hollow, his ears cold and contracted, the skin of his forehead tense and dry, and the colour of his face tending to a pale-green, or lead colour, one may give out for certain that death is very near at hand; unless the strength of the patient has been exhausted all at once by long watchings, or by a looseness, or being a long time without eating." This observation has been confirmed by those of succeeding physicians, who have, from him, denominated it the *Hippocratic face*. The lips hanging relaxed and cold, are likewise looked upon by this author as a confirmation of the foregoing prognostic. He took also his signs from the disposition of the eyes in particular. When a patient cannot bear the light; when he sheds tears involuntarily; when, in sleeping, some part of the white of the eye is seen, unless he usually sleeps after that manner, or has a looseness upon him: these signs, as well as the foregoing ones, prognosticate danger. The eyes deadened, as it were with a mist spread over them, or their brightness lost, likewise presages death, or great weakness. The eyes sparkling, fierce, and fixed, denote the patient to be delirious, or that he soon will be seized with a frenzy. When the patient sees any thing red, and like sparks of fire and lightning pass before his eyes, you may expect an hæmorrhagy; and this often happens before those crises which are to be attended by a loss of blood.

From the posture in bed; The condition of the patient is also shown by his posture in bed. If you find him lying on one side, his body, neck, legs, and arms, a little contracted, which is the posture of a man in health, it is a good sign: on the contrary, if he lies on his back, his arms stretched out, and his legs hanging down, it is a sign of great weakness; and particularly when the patient slides or lets himself fall down towards the feet, it denotes the approach of death. When a patient in a burning fever is continually feeling about with his hands and fingers, and moves them up before his face and eyes as if he was going to take away something that passed before them; or on his bed-covering, as if he was picking or searching for little straws, or taking away some filth, or drawing out little flocks of wool; all this is a sign that he is delirious, and that he will die. Amongst the other signs of a present or approaching delirium, he also adds this: When a patient who naturally speaks little begins to talk more than he used to do, or when one that talks much becomes silent, this change is to be reckoned a sort of delirium, or is a sign that the patient will soon fall into one. The frequent trembling or starting of the tendons of the wrist, presage likewise a delirium. As to the different sorts of delirium, Hippocrates is much more afraid of those that run upon mournful subjects, than such as are accompanied with mirth.

From respiration; When a patient breathes fast, and is oppressed, it is a sign that he is in pain, and that the parts above the diaphragm are inflamed. Breathing long, or when the patient is a great while in taking his breath, shows him to be delirious; but easy and natural respiration is always a good sign in acute diseases. Hippocrates depended much on respiration in making his prognostics; and therefore has taken care in several places to describe the different manner of a patient's breathing. Continual watchings in acute diseases, are signs of present pain, or a delirium near at hand.

From excrementitious discharges. Hippocrates also drew signs from all excrements, whatever they are, that are separated from the body of man. His most remarkable prognostics, however, were from the urine. The patient's urine, in his opinion, is best when the sediment is white, soft to the touch, and of an equal consistence. If it continue so during the course of the distemper, and till the time of the crisis, the patient is in no danger, and will soon be well. This is what Hippocrates called *concocted urine*, or what denotes the concoction of the humours; and he observed, that this concoction of the urine seldom appeared thoroughly, but on the days of the crisis which happily put an end to the distemper. Urine. "We ought (said Hippocrates) to compare the urine with the purulent matter which runs from ulcers. As the pus, which is white, and of the same quality with the sediment of the urine we are now speaking of, is a sign that the ulcer is on the point of closing; so that which is clear, and of another colour than white, and of an ill smell, is a sign that the ulcer is virulent, and in the same manner difficult to be cured: the urines that are like this we have described are only those which may be named good; all the rest are ill, and differ from one another only in the degrees of more and less. The first never appear but when nature has overcome the disease; and are a sign of the concoction of humours, without which you cannot hope for a certain cure. On the contrary, the last are made as long as the crudity remains, and the humours continue unconcocted. Among the urines of this last sort, the best are reddish, with a sediment that is soft, and of an equal consistence; which denotes, that the disease will be somewhat tedious, but without danger. The worst are those which are very red, and at the same time clear and without sediment; or that are muddy and troubled in the making. In urine there is often a sort of cloud hanging in the vessel in which it is received; the higher this rises, or the farther distant it is from the bottom, or the more different from the colour of the laudable sediment abovementioned, the more there is of crudity. That which is yellow, or of a sandy colour, denotes abundance of bile; that which is black is the worst, especially if it has an ill smell, and is either altogether muddy or altogether clear. That whose sediment is like large ground wheat, or little flakes or scales spread one upon another, or bran, presages ill, especially the last. The fat or oil that sometimes swims upon the top of the urine, and appears in a form something like a spider's web, is a sign of a consumption of the flesh and solid parts. The making

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king of a great quantity of urine is the sign of a crisis, and sometimes the quality of it shows how the bladder is affected. We must also observe, that Hippocrates compared the state of the tongue with the urine; that is to say, when the tongue was yellow, and charged with bile, the urine he knew must of course be of the same colour; and when the tongue was red and moist, the urine was of its natural colour.

Fæces.

His prognostics from the excretions by stool are as follow. Those that are soft, yellowish, of some consistence, and not of an extraordinary ill smell, that answer to the quantity of what is taken inwardly, and that are voided at the usual hours, are the best of all. They ought also to be of a thicker consistence when the distemper is near the crisis; and it ought to be taken for a good prognostic, when some worms, round and long, are evacuated at the same time with them. The prognosis, however, may still be favourable, though the matter excreted be thin and liquid, provided it make not too much noise in coming out, and the evacuation be not in a small quantity nor too often; nor in so great abundance, nor so often, as to make the patient faint. All matter that is watery, white, of a pale green, or red, or frothy and viscous, is bad. That which is blackish, or of a livid hue, is the most pernicious. That which is pure black, and nothing else but a discharge of black bile, always prognosticates very ill; this humour, from what part soever it comes, showing the ill disposition of the intestines. The matter that is of several different colours, denotes the length of the distemper; and, at the same time, that it may be of dangerous consequence. Hippocrates places in the same class the matter that is bilious or yellow, and mixed with blood, or green and black, or like the dregs or scrapings of the guts. The stools that consist of pure bile, or entirely of phlegm, he also looks upon to be very bad.

Matter cast up by vomiting ought to be mixed with bile and phlegm; where one of these humours only is observed, it is worse. That which is black, livid, green, or of the colour of a leek, indicates alarming consequences. The same is to be said of that which smells very ill; and if at the same time it be livid, death is not far off. The vomiting of blood is very often mortal.

Expectoration.

The spittings which give ease in diseases of the lungs and in pleurisies, are those that come up readily and without difficulty; and it is good if they be mixed at the beginning with much yellow: but if they appear of the same colour, or are red, a great while after the beginning of the distemper, are salt and acrimonious, and cause violent coughings, they are not good. Spittings purely yellow are bad; and those that are white, viscous, and frothy, give no ease. Whiteness is a good sign of concoction in regard to spittings; but they ought not at all to be viscous, nor too thick, nor too clear. We may make the same judgment of the excrements of the nose according to their concoction and crudity. Spittings that are black, green, and red, are of very bad consequence. In inflammations of the lungs, those that are mixed with bile and blood presage well if they appear at the beginning, but are bad if they arise not about the seventh day. But the worst sign in these distempers is, when there is no expectoration at all, and the too great quantity of matter that is ready to be discharged this way makes a rattling in the breast. After spitting of blood, the discharge of purulent matter often follows, which brings on a consumption, and at last death.

Sweat.

A kind good sweat is that which arises on the day of the crisis, and is discharged in abundance all over the body, and at the same time from all parts of the body, and thus carries off the fever: A cold sweat is alarming, especially in acute fevers, for in others it is only a sign of long continuance. When the patient sweats no where but on the head and neck, it is a sign that the disease will be long and dangerous. A gentle sweat in some particular part, of the head and breast, for instance, gives no relief, but denotes the seat of the distemper, or the weakness of the part. This kind of sweat was called by Hippocrates *ephidrosis*.

From the pulse.

The hypochondria, or the abdomen in general, ought always to be soft and even, as well on the right side as on the left. When there is any hardness or unevenness in those parts, or heat and swellings, or when the patient cannot endure to have it touched, it is a sign the intestines are indisposed.

Hippocrates also inquired into the state of the pulse, or the beating of the arteries. The most ancient physicians, however, and even Hippocrates himself, for a long time, by this word understood the violent pulsation that is felt in an inflamed part, without putting the fingers to it. It is observed by Galen, and other physicians, that Hippocrates touches on the subject of the pulse more slightly than any other on which he treats. But that our celebrated physician understood something even on this subject, is easily gathered from several passages in his writings; as when he observes, that in acute fevers the pulse is very quick and very great; and when he makes mention, in the same place, of trembling pulses, and those that beat slowly; when he observes, that in some diseases incident to women, when the pulse strikes the finger faintly, and in a languishing manner, it is a sign of approaching death. He remarks also, in the *Coacæ Prænotiones*, that he whose vein, that is to say, whose artery of the elbow, beats, is just going to run mad, or else that the person is at that time very much under the influence of anger.

From this account of Hippocrates, it will appear, that he was not near so much taken up with reasoning on the phænomena of diseases, as with reporting them. He was content to observe these phenomena accurately, to distinguish diseases by them, and judged of the event by comparing them exactly together. For his skill in prognostics he was indeed very remarkable, as we have already mentioned, insomuch that he and his pupils were looked upon by the vulgar as prophets. What adds very much to his reputation is, that he lived in an age when physic was altogether buried in superstition, and yet he did not suffer himself to be carried away by it; on the contrary, on many occasions, he expresses his abhorrence of it.

Having thus seen in what Hippocrates makes the difference between health and sickness to consist, and likewise the most remarkable signs from whence he drew his prognostics, we must now consider the means he prescribed for the preservation of health, and the

cure

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12 His maxims for the preſervation of health.

cure of diſeaſes. One of his principal maxims was this, That, to preſerve health, we ought not to overcharge ourſelves with too much eating, nor neglect the uſe of exerciſe and labour. In the next place, That we ought by no means to accuſtom ourſelves to too nice and exact a method of living; becauſe thoſe who have once begun to act by this rule, if they vary in the leaſt from it, find themſelves very ill; which does not happen to thoſe who take a little more liberty, and live ſomewhat more irregularly. Notwithſtanding this, he does not neglect to inquire diligently into what thoſe who were in health uſed for food in his time.

Diet.

Here we cannot help taking notice of the prodigious diſparity between the delicacy of the people in our days and in thoſe of Hippocrates: for he takes great pains to tell the difference between the fleſh of a dog, a fox, a horſe, and an aſs; which he would not have done if at that time they had not been uſed for victuals, at leaſt by the common people. Beſides theſe, however, Hippocrates ſpeaks of all other kinds of proviſion that are now in uſe; for example, ſalads, milk, whey, cheeſe, fleſh as well of birds as of four-footed beaſts, freſh and ſalt fiſh, eggs, all kinds of pulſe, and the different kinds of grain we feed on, as well as the different ſorts of bread that are made of it. He alſo ſpeaks very often of a ſort of liquid food, or broth, made of barley-meal, or ſome other grain, which they ſteeped for ſome time, and then boiled in water. With regard to drink, he takes a great deal of pains to diſtinguiſh the good waters from the bad. The beſt, in his opinion, ought to be clear, light, without ſmell or taſte, and taken out of the fountains that turn towards the eaſt. The ſalt-waters, thoſe that he calls hard, and thoſe that riſe out of fenny ground, are the worſt of all; he condemns alſo thoſe that come from melted ſnow. But though Hippocrates makes all thoſe diſtinctions, he adviſes thoſe who are in health to drink of the firſt water that comes in their way. He ſpeaks alſo of alum waters, and thoſe that are hot; but does not enlarge upon their qualities. He adviſes to mix wine with an equal quantity of water: and this (he ſays) is the juſt proportion; by uſing which the wine will expel what is hurtful to the body, and the water will ſerve to temper the acrimony of the humours.

Exerciſe.

For thoſe that are in health, and likewiſe for ſuch as are ſick, Hippocrates adviſes exerciſe. The books, however, which treat on this ſubject, M. Le Clerc conjectures to have been written by Herodicus, who firſt introduced gymnaſtic exerciſe into medicine, and who is ſaid by Hippocrates himſelf to have killed ſeveral people by forcing them to walk while they were afflicted with fevers and other inflammatory diſorders. The advices given in them conſiſt moſtly in directions for the times in which we ought to walk, and the condition we ought to be in before it; when we ought to walk ſlowly, and when to run, &c.; and all this with reſpect to different ages and temperaments, and with deſign to bring the body down, or diſſipate the humours. Wreſtling, although a violent exerciſe, is numbered with the reſt. In the ſame place alſo mention is made of a play of the hands and fingers, which was thought good for health, and called *chironomie;* and of another diverſion which was performed round a ſort of ball hung up, which they called *corycus*, and which they ſtruck forward with both their hands.

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Excretions.

With regard to thoſe things which ought to be ſeparated from, or retained in the human body, Hippocrates obſerves, that people ought to take great care not to load themſelves with excrements, or keep them in too long; and beſides the exerciſe above-mentioned, which carries off one part of them, and which he preſcribed chiefly on this account, he adviſes people to excite and rouſe up nature when ſhe flagged, and did not endeavour to expel the reſt, or take care of the impediments by which ſhe was reſiſted. For this reaſon he preſcribed meats proper for looſening the belly; and when theſe were not ſufficient, he directed the uſe of clyſters and ſuppoſitories. For thin and emaciated perſons he directed clyſters compoſed only of milk and oily unctuous ſubſtances, which they mixed with a decoction of chick-peaſe; but for ſuch as were plethoric, they only made uſe of ſalt or ſea-water.

As a preſervative againſt diſtempers, Hippocrates alſo adviſed the uſe of vomits, which he directed to be taken once or twice a month during the time of winter and ſpring. The moſt ſimple of theſe were made of a decoction of hyſſop, with an addition of a little vinegar and ſalt. He made thoſe that were of a ſtrong and vigorous conſtitution take this liquor in a morning faſting; but ſuch as were thin and weakly took it after ſupper.—Venery, in his opinion, is wholeſome, provided people conſult their ſtrength, and do not purſue it to exceſs; which he finds fault with on all occaſions, and would have exceſs avoided alſo in relation to ſleep and watching. In his writings are likewiſe to be found ſeveral remarks concerning good and bad air; and he makes it appear that the good or bad diſpoſition of this element does not depend ſolely on the difference of the climate, but on the ſituation of every place in particular. He ſpeaks alſo of the good and bad effects of the paſſions, and recommends moderation in regard to them.

From what we have already related concerning the opinions of Hippocrates, it may naturally be concluded, that for the moſt part he would be contented with obſerving what the ſtrength of nature is able to accompliſh without being aſſiſted by the phyſician. That this was really the caſe, may be eaſily perceived from a peruſal of his books entitled, "Of epidemical diſtempers;" which are, as it were, journals of the practice of Hippocrates: for there we find him often doing nothing more than deſcribing the ſymptoms of a diſtemper, and informing us what has happened to the patient day after day, even to his death or recovery, without ſpeaking a word of any kind of remedy. Sometimes, however, he did indeed make uſe of remedies; but theſe were exceedingly ſimple and few, in compariſon of what have been given by ſucceeding practitioners. Theſe remedies we ſhall preſently conſider, after we have given an abridgement of the principal maxims on which his practice is founded.

13 His maxims for the cure of diſeaſe.

Hippocrates aſſerted in the firſt place, That contraries, or oppoſites, are the remedies for each other; and this maxim he explains by an aphoriſm; in which he ſays, that evacuations cure thoſe diſtempers which come from repletion, and repletion thoſe that are cauſed

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fed by evacuation. So heat is destroyed by cold, and cold by heat, &c. In the second place, he asserted, that physic is an addition of what is wanting, and a subtraction or retrenchment of what is superfluous: an axiom which is explained by this, viz. that there are some juices or humours, which in particular cases ought to be evacuated, or driven out of the body, or dried up; and some others which ought to be restored to the body, or caused to be produced there again. As to the method to be taken for this addition or retrenchment, he gives this general caution, That you ought to be careful how you fill up, or evacuate, all at once, or too quickly, or too much; and that it is equally dangerous to heat or cool again on a sudden; or rather, you ought not to do it: every thing that runs to an excess being an enemy to nature. In the fourth place, Hippocrates allowed that we ought sometimes to dilate, and sometimes to lock up: to dilate, or open the passages by which the humours are voided naturally, when they are not sufficiently opened, or when they are closed; and, on the contrary, to lock up or straiten the passages that are relaxed, when the juices that pass there ought not to pass, or when they pass in too great quantity. He adds, that we ought sometimes to smooth, and sometimes to make rough; sometimes to harden, and sometimes to soften again; sometimes to make more fine or supple; sometimes to thicken; sometimes to rouse up, and at other times to stupify or take away the sense; all in relation to the solid parts of the body, or to the humours. He gives also this farther lesson, That we ought to have regard to the course the humours take, from whence they come, and whither they go; and in consequence of that, when they go where they ought not, that we make them take a turn about, or carry them another way, almost like the turning the course of a river: or, upon other occasions, that we endeavour if possible to recal, or make the same humours return back again; drawing upward such as have a tendency downward, and drawing downward such as tend upward. We ought also to carry off, by convenient ways, that which is necessary to be carried off; and not let the humours once evacuated enter into the vessels again. Hippocrates gives also the following instruction, That when we do any thing according to reason, though the success be not answerable, we ought not too easily, or too hastily, to alter the manner of acting, as long as the reasons for it are yet good. But as this maxim might sometimes prove deceitful, he gives the following as a corrector to it: "We ought (says he) to mind with a great deal of attention what gives ease, and what creates pain; what is easily supported, and what cannot be endured." We ought not to do any thing rashly; but ought often to pause, or wait, without doing any thing: by this way, if you do the patient no good, you will at least do him no hurt.

These are the principal and most general maxims of the practice of Hippocrates, and which proceed upon the supposition laid down at the beginning, viz. that nature cures diseases. We next proceed to consider particularly the remedies employed by him, which will serve to give us further instructions concerning his practice.

14 His maxims respecting diet.

Diet was the first, the principal, and often the only remedy made use of by this great physician to answer the greatest part of the intentions above mentioned: by means of it he opposed moist to dry, hot to cold, &c.; and what he looked upon to be the most considerable point was, that thus he supported nature, and assisted her to overcome the malady. The dietetic part of medicine was so much the invention of Hippocrates himself, that he was very desirous to be accounted the author of it; and the better to make it appear that it was a new remedy in his days, he says expressly, that the ancients had wrote almost nothing concerning the diet of the sick, having omitted this point, though it was one of the most essential parts of the art.

15 Diet in acute diseases.

The diet prescribed by Hippocrates for patients labouring under acute distempers, differed from that which he ordered for those afflicted with chronical ones. In the former, which require a more particular exactness in relation to diet, he preferred liquid food to that which was solid, especially in fevers. For these he used a sort of broth made of cleansed barley; and to this he gave the name of *ptisan*. The manner in which the ancients prepared a ptisan was as follows: They first steeped the barley in water till it was plumped up; and afterwards they dried it in the sun, and beat it to take off the husk. They next ground it; and having let the flour boil a long time in the water, they put it out into the sun, and when it was dry they pressed it close. It is properly this flour so prepared that is called *ptisan*. They did almost the same thing with wheat, rice, lentils, and other grain: but they gave these ptisans the name of the grain from whence they were extracted, as *ptisan of lentils*, *rice*, &c. whereas the ptisan of barley was called simply *ptisan*, on account of the excellency of it. When they wanted to use it, they boiled one part of it in 10 or 15 of water; and when it began to grow plump in boiling, they added a little vinegar, and a very small quantity of anise or leek, to keep it from clogging or filling the stomach with wind. Hippocrates prescribes this broth for women that have pains in their belly after delivery. "Boil some of this ptisan (says he), with some leek, and the fat of a goat, and give it to the woman in bed." This will not be thought very singular, if we reflect on what has been hinted above concerning the indelicate manner of living in those times. He preferred the ptisan to all other food in fevers, because it softened and moistened much, and was besides of easy digestion. If he was concerned in a continual fever, he would have the patient begin with a ptisan of a pretty thick consistence, and go on by little and little, lessening the quantity of barley-flour as the height of the distemper approached; so that he did not feed the patient but with what he called the *juice of the ptisan*; that is, the ptisan strained, where there was but very little of the flour remaining, in order that nature being discharged in part from the care of digesting the aliments, she might the more easily hold out to the end, and overcome the distemper, or the cause of it. With regard to the quantity, he caused the ptisan to be taken twice a-day by such patients as in health used to take two meals a-day, not thinking it convenient that those who were sick should eat oftener than when they were well. He also would not allow eating twice a-day to those who eat but once in that time when in health. In the paroxysm of a fever

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fever he gave nothing at all; and in all diſtempers where there are exacerbations, he forbid nouriſhment while the exacerbations continued. He let children eat more; but thoſe who were grown up to man's eſtate, or were of an advanced age, leſs; making allowance, however, for the cuſtom of each particular perſon, or for that of the country.

But though he was of opinion that too much food ought not to be allowed to the ſick, he was not of the mind of ſome phyſicians who preſcribed long abſtinence, eſpecially in the beginning of fevers. The reaſon he gave for this was, that the contrary practice weakened the patients too much during the firſt days of the diſtemper, by which means their phyſicians were obliged to allow them more food when the illneſs was at its height, which in his opinion was improper. Beſides, in acute diſtempers, and particularly in fevers, Hippocrates made choice of refreſhing and moiſtening nouriſhment; and amongſt other things preſcribed orange, melon, ſpinach, gourd, and dock. This ſort of food he gave to thoſe that were in a condition to eat, or could take ſomething more than a ptiſan.

Drink.

The drink he commonly gave to his patients was made of eight parts of water and one of honey. In ſome diſtempers they added a little vinegar; but beſides theſe, they had another ſort named κυκεων, or *mixture*. One preſcription of this ſort we find intended for a conſumptive perſon; it conſiſted of rue, aniſe, celery, coriander, juice of pomegranate, the rougheſt red wine, water, flour of wheat and barley, with old cheeſe made of goats milk. Hippocrates did not approve of giving plain water to the ſick; but though he generally preſcribed the drinks above mentioned, he did not abſolutely forbid the uſe of wine, even in acute diſtempers and fevers, provided the patients were not delirious nor had pains in their head. Beſides, he took care to diſtinguiſh the wines proper in theſe caſes: preferring to all other ſorts white-wine that is clear and has a great deal of water, with neither ſweetneſs nor flavour.

16 Diet in chronic diſeaſes.

Theſe are the moſt remarkable particulars concerning the diet preſcribed by Hippocrates in acute diſtempers; in chronical ones he made very much uſe of milk and whey; though we are not certain whether this was done on account of the nouriſhment expected from them, or that he accounted them medicines.

17 His maxims reſpecting bathing.

There were many diſeaſes for which he judged the bath was a proper remedy; and he takes notice of all the circumſtances that are neceſſary in order to cauſe the patient receive benefit from it, among which the following are the principal. The patient that bathes himſelf muſt remain ſtill and quiet in his place without ſpeaking while the aſſiſtants throw water over his head or are wiping him dry; for which laſt purpoſe he deſired them to keep ſponges, inſtead of that inſtrument called by the ancients *ſtrigil*, which ſerved to rub off from the ſkin the dirt and naſtineſs left upon it by the unguents and oils with which they anointed themſelves. He muſt alſo take care not to catch cold; and muſt not bathe immediately after eating and drinking, nor eat or drink immediately after coming out of the bath. Regard muſt alſo be had whether the patient has been accuſtomed to bathe while in health, and whether he has been benefited or hurt by it. Laſtly, he muſt abſtain from the bath when the body is too open, or too coſtive, or when he is too weak; or if he has an inclination to vomit, a great loſs of appetite, or bleeds at the noſe. The advantage of the bath, according to Hippocrates, conſiſts in moiſtening and refreſhing, taking away wearineſs, making the ſkin ſoft and the joints pliant; in provoking urine, making the noſtrils open, and opening the other excretories. He allows two baths in a day to thoſe who have been accuſtomed to it in health.

18 His maxims reſpecting exerciſe.

In chronical diſtempers Hippocrates approved very much of exerciſe, though he did not allow it in acute ones: but even in theſe he did not think that a patient ought always to lie a-bed; but tells us, that "we muſt ſometimes puſh the timorous out of bed, and rouſe up the lazy."

19 His maxims reſpecting purgation.

When he found that diet and exerciſe were not ſufficient to eaſe nature of a burden of corrupted humours, he was obliged to make uſe of other means, of which *purgation* was one. By this word he underſtood all the contrivances that are made uſe of to diſcharge the ſtomach and bowels; though it commonly ſignifies only the evacuation by the belly by ſtool. This evacuation he imagined to be occaſioned by the purgative medicines attracting the humours to themſelves. When firſt taken into the body, he thought they attracted that humour which was moſt ſimilar to them, and then the others, one after another.—Moſt of the purgatives uſed in his time were emetics alſo, or at leaſt were very violent in their operation downwards. Theſe were the white and black hellebore; the firſt of which is now reckoned among the poiſons. He uſed alſo the Cnidian berries, which are nothing elſe but the ſeeds of thymelea or chamælea; cneorum peplium, which is a ſort of milk-thiſtle; thapſia; the juice of hippophaë, a ſort of rhamnus; elaterium, or juice of the wild cucumber; flowers of braſs, coloquintida, ſcammony the magneſian ſtone, &c.

As theſe purgatives were all very ſtrong, Hippocrates was extremely cautious in their exhibition. He did not preſcribe them in the dog-days; nor did he ever purge women with child, and very ſeldom children or old people. He principally uſed purgatives in chronical diſtempers; but was much more wary in acute ones. In his books intitled "Of Epidemical Diſtempers," there are very few patients mentioned to whom he gave purgative medicines. He alſo takes notice expreſsly, that theſe medicines having been given in caſes of the diſtempers of which he was treating, had produced very bad effects. We are not, however, from this to conclude, that Hippocrates abſolutely condemned purging in acute diſtempers; for in ſome places he expreſsly mentions his having given them with ſucceſs. He was of opinion, for inſtance, that purging was good in a pleuriſy when the pain was ſeated below the diaphragm; and in this caſe he gave black hellebore, or ſome peplium mixed with the juice of *laſerpitium*, which is ſuppoſed to have been our aſafætida.

The principal rule Hippocrates gives with relation to purging is, that we ought only to purge off the humours that are concocted, and not thoſe that are yet crude, taking particular care not to do it at the beginning of the diſtemper, leſt the humours ſhould be

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be difturbed or ftirred up, which happens pretty often. He was not, however, the firft who remarked that it would be of ill confequence to ftir the humours in the beginning of an acute diftemper. The Egyptian phyficians had before obferved the fame thing. By the *beginning* of a diftemper, Hippocrates underftood all the time from the firft day to the fourth complete.

Hippocrates imagined that each purgative medicine was adapted to the carrying off fome particular humour; and hence the diftinction of purgatives into hydragogue, cholagogue, &c. which is now juftly exploded. In confequence of this notion, which prevailed long after his time, he pretended that we knew if a purgative had drawn from the body what was fit to be evacuated according as we found ourfelves well or ill upon it. If we found ourfelves well, it was a fign that the medicine had effectually expelled the offending humour. On the contrary, if we were ill, he imagined, whatever quantity of humour came away, that the humour which caufed the illnefs ftill remained; not judging of the goodnefs or badnefs of a purge by the quantity of matters that were voided by it, but by their quality and the effect that followed after it.

Vomits were alfo pretty much ufed as medicines by Hippocrates. We have already feen what thofe were which he prefcribed to people in health by way of preventives. With regard to the fick, he fometimes advifed them to the fame, when his intentions were only to cleanfe the ftomach. But when he had a mind to recal the humours, as he termed it, from the inmoft receffes of the body, he made ufe of brifker remedies. Among thefe was white hellebore; and this indeed he moft frequently ufed to excite vomiting. He gave this root particularly to melancholy and mad people; and from the great ufe made of it in thefe cafes by Hippocrates and other ancient phyficians, the phrafe *to have need of hellebore*, became a proverbial expreffion for being out of one's fenfes. He gave it alfo in defluxions, which come, according to him, from the brain, and throw themfelves on the noftrils or ears, or fill the mouth with faliva, or that caufe ftubborn pains in the head, and a wearinefs or an extraordinary heavinefs, or a weaknefs of the knees, or a fwelling all over the body. He gave it to confumptive perfons in broth of lentils, to fuch as were afflicted with the dropfy called *leucophlegmatia*, and in other chronical diforders. But we do not find that he made ufe of it in acute diftempers, except in the cholera morbus, where he fays he prefcribed it with benefit. Some took this medicine fafting; but moft took it after fupper, as was commonly practifed with regard to vomits taken by way of prevention. The reafon why he gave this medicine moft commonly after eating was, that by mixing with the aliments, its acrimony might be fomewhat abated, and it might operate with lefs violence on the membranes of the ftomach. With the fame intention alfo he fometimes gave a plant called *fefamoides*, and fometimes mixed it with hellebore. Laftly, in certain cafes he gave what he called *foft* or *fweet* hellebore. This term had fome relation to the quality of the hellebore, or perhaps to the quantity he gave of it.

When Hippocrates intended only to keep the body open, or evacuate the contents of the inteftines, he made ufe of fimples; as for example, the herb mercury, or cabbage; the juice or decoction of which he ordered to be drank. For the fame purpofe he ufed whey, and alfo cows and affes milk; adding a little falt to it, and fometimes letting it boil a little. If he gave affes milk alone, he caufed a great quantity of it to be taken, fo that it muft of neceffity loofen the body. In one place he prefcribes no lefs than nine pounds of it to be taken as a laxative, but does not fpecify the time in which it was to be taken. With the fame intention he made ufe of fuppofitories and clyfters. The former were compounded of honey, the juice of the herb mercury, of nitre, powder of colocynth, and other fharp ingredients, to irritate the anus. Thefe they formed into a ball, or into a long cylindrical mafs like a finger. The clyfters he made ufe of for fick people were fometimes the fame with thofe already mentioned as preventives for people in health. At other times he mixed the decoction of herbs with nitre, honey, and oil, or other ingredients, according as he imagined he could by that means attract, wafh, irritate, or foften. The quantity of liquor he ordered was about 36 ounces; from which it is probable he did not intend that it fhould all be ufed at one time.

On fome occafions Hippocrates propofed to purge the head alone. This practice he employed, after purging the reft of the body, in an apoplexy, inveterate pains of the head, a certain fort of jaundice, a confumption, and the greateft part of chronical diftempers. For that purpofe he made ufe of the juices of feveral plants, as celery; to which he fometimes added aromatic drugs, making the patients fnuff up this mixture into their noftrils. He ufed alfo powders compounded of myrrh, the flowers of brafs, and white hellebore, which he caufed them put up into the nofe, to make them fneeze, and to draw the phlegm from the brain. For the fame purpofe alfo he ufed what he calls *tetragonon*, that is, "fomething having four angles;" but what this was, is now altogether unknown, and was fo even in the days of Galen. The latter phyfician, however, conjectures it to be antimony, or certain flakes found in it.

In the diftemper called *empyema* (or a collection of matter in the breaft), he made ufe of a very rough medicine. He commanded the patient to draw in his tongue as much as he was able; and when that was done, he endeavoured to put into the hollow of the lungs a liquor that irritated the part, which, raifing a violent cough, forced the lungs to difcharge the purulent matter contained in them. The materials that he ufed for this purpofe were of different forts; fometimes he took the root of arum, which he ordered to be boiled with a little falt, in a fufficient quantity of water and oil; diffolving a little honey in it. At other times, when he intended to purge more ftrongly, he took the flowers of copper and hellebore; after that he fhook the patient violently by the fhoulders, the better to loofen the pus. This remedy, according to Galen, he received from the Cnidian phyficians; and it has never been ufed by the fucceeding ones, probably becaufe the patients could not fuffer it.

10
His maxims refpecting blood-letting.

Blood-letting was another method of evacuation pretty much ufed by Hippocrates. Another aim he had in this, befides the mere evacuation, was to divert or recal the courfe of the blood when he imagined it was going where it ought not. A third end of bleeding was to procure a free motion of the blood and fpirits,

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rits, as we may gather from the following paſſage: "When any one becomes ſpeechleſs of a ſudden (ſays he), it is cauſed by the ſhutting of the veins, eſpecially when it happens to perſons otherwiſe in good health, without any outward violence. In this caſe the inward vein of the right-arm muſt be opened, and more or leſs blood taken away, according to the age or conſtitution of the patient. Thoſe that loſe their ſpeech thus have great fluſhings in their face, their eyes are ſtiff, their arms are diſtended, their teeth gnaſh, they have palpitations of the arteries, cannot open their jaws, the extremities are cold, and the ſpirits are intercepted in the veins. If pain enſues, it is by the acceſſion of the black bile and ſharp humours. For the internal parts being vellicated or irritated by theſe humours, ſuffer very much; and the veins, being alſo irritated and dried, diſtend themſelves extraordinarily, and are inflamed, and draw all that can flow to them; ſo that the blood corrupting, and the ſpirits not being able to paſs through the blood by their ordinary paſſages, the parts grow cold by reaſon of this ſtagnation of the ſpirits. Hence come giddineſs, loſs of ſpeech, and convulſions, if this diſorder reaches to the heart, the liver, or to the great veins. From hence ariſe alſo epilepſies and palſies, if the defluxions fall upon the parts laſt mentioned; and that they dry up, becauſe the ſpirits are denied a paſſage through them. In this caſe, after fomentation, a vein muſt be opened, while the ſpirits and humours are yet ſuſpended and unſettled."

Hippocrates had alſo a fourth intention for bleeding, and this was refreſhment. So in the iliac paſſion, he orders bleeding in the arm and in the head; to the end, ſays he, that the ſuperior venter, or the breaſt, may ceaſe to be overheated. With regard to this evacuation, his conduct was much the ſame as to purging, in reſpect of time and perſons. We ought, ſays he, to let blood in acute diſeaſes, when they are violent, if the party be luſty and in the flower of his age. We ought alſo to have regard to the time, both in reſpect to the diſeaſe and to the ſeaſon in which we let blood. He alſo informs us, that blood ought to be let in great pains, and particularly in inflammations. Among theſe he reckons ſuch as fall upon the principal viſcera, as the liver, lungs, and ſpleen, as alſo the quinſy and pleuriſy, if the pain of the latter be above the diaphragm. In theſe caſes he would have the patients blooded till they faint, eſpecially if the pain be very acute; or rather he adviſes that the orifice ſhould not be cloſed till the colour of the blood alters, ſo that from livid it turn red, or from red livid. In a quinſey he blooded in both arms at once. Difficulty of breathing he alſo reckons among the diſtempers that require bleeding; and he mentions another ſort of inflammation of the lungs, which he calls a ſwelling or tumor of the lungs ariſing from heat; in which caſe he adviſes to bleed in all parts of the body; and directs particularly to the arms, tongue, and noſtrils. To make bleeding the more uſeful in all pains, he directed to open the vein neareſt the part affected; in a pleuriſy he directs to take blood from the arm of the ſide affected; and for the ſame reaſon, in pains of the head, he directs the veins of the noſe and forehead to be opened. When the pain was not urgent, and bleeding was adviſed by way of prevention, he directed the blood to be taken from the parts fartheſt off, with a deſign to divert the blood inſenſibly from the ſeat of pain. The higheſt burning fevers, which ſhow neither ſigns of inflammation nor pain, he does not rank among thoſe diſtempers that require bleeding. On the contrary, he maintains that a fever itſelf is in ſome caſes a reaſon againſt bleeding. If any one, ſays he, has an ulcer in the head, he muſt bleed, *unleſs he has a fever*. He ſays further, thoſe that loſe their ſpeech of a ſudden muſt be blooded, unleſs they have a fever. Perhaps he was afraid of bleeding in fevers, becauſe he ſuppoſed that they were produced by the bile and pituita, which grew hot, and afterwards heated the whole body, which is, ſays he, what we call *fever*, and which, in his opinion, cannot well be evacuated by bleeding. In other places alſo he looks upon the preſence or abundance of bile to be an objection to bleeding; and he orders to forbear veneſection even in a pleuriſy, if there be bile. To this we muſt add, that Hippocrates diſtinguiſhed very particularly between a fever which followed no other diſtemper, but was itſelf the original malady, and a fever which came upon inflammation. In the early ages of phyſic, the firſt were only properly called *fevers:* the others took their names from the parts affected; as *pleuriſy*, *peripneumony*, *hepatitis*, *nephritis*, &c. which names ſignify that the pleura, the lungs, the liver, or the kidneys, are diſeaſed, but do not intimate the fever which accompanies the diſeaſe. In this latter ſort of fever Hippocrates conſtantly ordered bleeding, but not in the former. Hence, in his books Of Epidemic Diſtempers, we find but few directions for bleeding in the acute diſtempers, and particularly in the great number of continual and burning fevers there treated of. In the firſt and third book we find but one ſingle inſtance of bleeding, and that in a pleuriſy; in which, too, he ſtaid till the eighth day of the diſtemper. Galen, however, and moſt other commentators on Hippocrates, are of opinion that he generally blooded his patients plentifully in the beginning of acute diſorders, though he takes no notice of it in his writings. But had this been the caſe, he would not perhaps have had the opportunity of ſeeing ſo many fevers terminate by criſes, or natural evacuations, which happen of themſelves on certain days. Hippocrates, in fact, laid ſo much weight upon the aſſiſtance of nature and the method of diet, which was his favourite medicine, that he thought if they took care to diet the patients before mentioned, according to rule, they might leave the reſt to nature. Theſe are his principles, from which he never deviates; ſo that his pieces Of Epidemical Diſeaſes ſeem to have been compoſed only with an intention to leave to poſterity an exact model of management in purſuance of theſe principles.

With regard to the rules laid down by Hippocrates for bleeding, we muſt further take notice, that in all diſeaſes which had their ſeat above the liver, he blooded in the arm, or in ſome of the upper parts of the body; but for thoſe that were ſituated below it he opened the veins of the foot, ankle, or ham. If the belly was too laxative, and bleeding was at the ſame time thought neceſſary, he ordered the looſeneſs to be ſtopped before bleeding.

Almoſt all theſe inſtances, however, regard ſcarce any thing but acute diſtempers; but we find ſeveral con-

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concerning chronical diseases. "A young man complained of great pain in his belly, with a rumbling while he was fasting, which ceased after eating: this pain and rumbling continuing, his meat did him no good; but, on the contrary, he daily wasted and grew lean. Several medicines, as well purges as vomits, were given him in vain. At length it was resolved to bleed him by intervals, first in one arm and then in the other, till he had scarce any blood left, and by this method he was perfectly cured."

Hippocrates let blood also in a dropsy, even in a tympany; and in both cases he prescribes bleeding in the arm. In a disease occasioned by an overgrown spleen, he proposes bleeding several times repeated at a vein of the arm which he calls the *splenetic;* and in a kind of jaundice, he proposes bleeding under the tongue. On some occasions he took away great quantities of blood, as appears from what we have already observed. Sometimes he continued the blooding till the patient fainted: at other times he would blood in both arms at once; at others, he did it in several places of the body, and at several times. The veins he opened were those of the arm, the hands, the ankles on both sides, the hams, the forehead, behind the head, the tongue, the nose, behind the ears, under the breasts, and those of the arms; besides which, he burnt others, and opened several arteries. He likewise used cupping-vessels, with intent to recal or withdraw the humours which fell upon any part. Sometimes he contented himself with the bare attraction made by the cupping-vessels, but sometimes also he made scarifications.

21 His maxims respecting diuretics and sudorifics.

When bleeding and purging, which were the principal and most general means used by Hippocrates for taking off a plethora, proved insufficient for that purpose, he had recourse to diuretics and sudorifics. The former were of different sorts, according to the constitution of the persons: sometimes baths, and sometimes sweet wine, were employed to provoke urine; sometimes the nourishment which we take contributes to it: and amongst those herbs which are commonly eaten, Hippocrates recommends garlic, leeks, onions, cucumbers, melons, gourds, fennel, and all other things which have a biting taste and a strong smell. With these he numbers honey, mixed with water or vinegar, and all salt meats. But, on some occasions, he took four cantharides, and, pulling off their wings and feet, gave them in wine and honey. These remedies were given in a great number of chronical distempers after purging, when he thought the blood was overcharged with a sort of moisture which he calls *ichor;* or in suppressions of urine, and when it was made in less quantity than it ought. There were also some cases in which he would force sweat as well as urine; but he neither mentions the diseases in which sudorifics are proper, nor lets us know what medicines are to be used for this purpose, except in one single passage, where he mentions sweating, by pouring upon the head a great quantity of water till the feet sweat; that is, till the sweat diffuses itself over the whole body, running from head to foot. After this he would have them eat boiled meat, and drink pure wine, and being well covered with clothes, lay themselves down to rest. The disease for which he proposes the above mentioned remedy is a fever; which is not, according to him, produced by bile or pituita, but by mere lassitude, or some other similar cause; from whence we may conclude that he did not approve of sweating in any other kind of fever.

Other remedies which Hippocrates tells us he made use of were those that purged neither bile nor phlegm, but act by cooling, drying, heating, moistening, or by closing and thickening, resolving and dissipating. These medicines, however, he does not particularly mention; and it is probable they were only some particular kinds of food. To these he joined *hypnotics*, or such things as procure sleep; but these last were used very seldom, and, it is most probable, were only different preparations of poppies.

22 The use he made of specifics.

Lastly, besides the medicines already mentioned, which acted in a sensible manner, Hippocrates made use of others called *specifics;* whose action he did not understand, and for the use of which he could give no reason besides his own experience, or that of other physicians. These he had learned from his predecessors the descendants of Æsculapius, who, being *empirics*, did not trouble themselves about inquiring into the operation of their remedies, provided their patients were cured.

23 His external applications.

Of the external remedies prescribed by Hippocrates, fomentations were the chief. These were of two kinds. The one was a sort of bath, in which the patient sat in a vessel full of a decoction of simples appropriated to his malady; so that the part affected was soaked in the decoction. This was chiefly used in distempers of the womb, of the arms, the bladder, the reins, and generally all the parts below the diaphragm. The second way of fomenting was, to take warm water and put it into a skin or bladder, or even into a copper or earthen vessel, and to apply it to the part affected; as, for example, in a pleurisy. They used likewise a large sponge, which they dipped in the water, or other hot liquor, and squeezed out part of the liquor before they applied it. The same use they made of barley, vetches, or bran, which were boiled in some proper liquor, and applied in a linen bag. These are called *moist* fomentations. The dry ones were made of salt or millet, heated considerably, and applied to the part. Another kind of fomentation was the vapour of some hot liquor; an instance of which we find in his first book of Womens Distempers. He cast, at several times, bits of red-hot iron into urine, and, covering up the patient close, caused her to receive the steam below. His design in these kinds of fomentations was to warm the part, to resolve or dissipate, and draw out the peccant matter, to mollify and assuage pain, to open the passages, or even to shut them, according as the fomentations were emollient or astringent.

24 Fomentations.

25 Fumigations.

Fumigations were likewise very often used by Hippocrates. In the quinsey, he burned hyssop with sulphur and pitch, and caused the smoke to be drawn into the throat by a funnel; and by this means he brought away abundance of phlegm through the mouth and through the nose. For this purpose he took nitre, marjoram, and cress-seeds, which he boiled in water, vinegar, and oil, and, while it was on the fire, caused the patient to draw in the steam by a pipe. In his works we find a great number of fumigants for the distempers of women, to promote the menstrual flux, Hippocrates

flux, to check it, to help conception, and to eafe pains in the matrix, or the fuffocation of it. On thefe occafions he ufed fuch aromatics as were then known, viz. cinnamon, caffia, myrrh, and feveral odoriferous plants; likewife fome minerals, fuch as nitre, fulphur, and pitch, and caufed them to receive the vapours through a funnel into the uterus.

26 Gargles.

Gargles, a kind of fomentations for the mouth, were alfo known to Hippocrates. In the quinfey he ufed a gargle made of marjoram, favory, celery, mint, and nitre, boiled with water and a little vinegar. When this was ftrained, they added honey to it, and wafhed their mouths frequently with it.

27 Oils and ointments.

Oils and ointments were likewife much ufed by Hippocrates, with a view to mollify and abate pain, to ripen boils, refolve tumors, refresh after wearinefs, make the body fupple, &c. For this purpofe, fometimes pure oil of olives was ufed; fometimes certain fimples were infufed in it, as the leaves of myrtle and rofes; and the latter kind of oil was in much requeft among the ancients. There were other forts of oils fometimes in ufe, however, which were much more compounded. Hippocrates fpeaks of one called *fufinum*, which was made of the flowers of the iris, of fome aromatics, and of an ointment of narciffus made with the flowers of narciffus and aromatics infufed in oil. But the moft compounded of all his ointments was that called *netopum*, which he made particularly for women; and confifted, according to Hefychius, of a great number of ingredients. Another ointment, to which he gave the name of *ceratum*, was compofed of oil and wax. An ointment which he recommends for the foftening of a tumor, and the cleanfing of a wound, was made by the following receipt: "Take the quantity of a nut of the marrow or fat of a fheep, of maftic or turpentine the quantity of a bean, and as much wax; melt thefe over a fire, with oil of rofes, for a ceratum." Sometimes he added pitch and wax, and, with a fufficient quantity of oil, made a compofition fomewhat more confiftent than the former, which he called *cerapiffus*.

28 Cataplafms.

Cataplafms were a fort of remedies lefs confiftent than the two former. They were made of powders or herbs fteeped or boiled in water or fome other liquor, to which fometimes they added oil. They were ufed with a view to foften or refolve tumors, ripen abfceffes, &c. though they had alfo cooling cataplafms made of the leaves of beets or oak, fig or olive-trees, boiled in water.

29 Collyria.

Laftly, to complete the catalogue of the external remedies ufed by Hippocrates, we fhall mention a fort of medicine called *collyrium*. It was compounded of powders, to which was added a fmall quantity of fome ointment, or juice of a plant, to make a folid or dry mafs; the form of which was long and round, which was kept for ufe. Another compofition of much the fame nature was a fort of lozenge of the bignefs of a fmall piece of money, which was burnt upon coals for a perfume, and powdered for particular ufes. In his works we find likewife defcriptions of powders for feveral ufes, to take off fungous flefh, and to blow into the eyes in opthalmies, &c.

Thefe were almoft all the medicines ufed by Hippocrates for external purpofes. The compound medicines given inwardly were either liquid, folid, or lambative. The liquid ones were prepared either by decoction or infufion in a proper liquor, which, when ftrained, was kept for ufe; or by macerating certain powders in fuch liquors, and fo taking them together, or by mixing different kinds of liquors together. The folid medicines confifted of juices infpiffated; of gums, refins, or powders, made up with them or with honey, or fomething proper to give the neceffary confiftence to the medicine. Thefe were made up in a form and quantity fit to be fwallowed with eafe. The lambative was of a confiftence between folid and fluid; and the patients were obliged to keep it for fome time to diffolve in the mouth, that they might fwallow it leifurely. This remedy was ufed to take off the acrimony of thofe humours which fometimes fall upon this part, and provoke coughing and other inconveniences. The bafis of this laft compofition was honey. It is worth our obfervation, that the compound medicines of Hippocrates were but very few, and compofed only of four or five ingredients at moft; and that he not only underftood pharmacy, or the art of compounding medicines, but prepared fuch as he ufed himfelf, or caufed his fervants prepare them in his houfe by his directions.

We have thus given fome account of the ftate of medicine as practifed and taught by Hippocrates, who, as we have already obferved, has for many ages been juftly confidered as the father of phyfic. For when we attend to the ftate in which he found medicine, and the condition in which he left it, we can hardly beftow fufficient admiration on the judgment and accuracy of his obfervations. After a life fpent in unwearied induftry, he is faid to have died at Lariffa, a city in Theffaly, in the 101ft year of his age, 361 years before the birth of Chrift.

After the days of Hippocrates, medicine in ancient Greece gradually derived improvement from the labour of other phyficians of eminence. And we may particularly mention three to whom its future progrefs feems to have been not a little indebted, viz. Praxagoras, Erafiftratus, and Herophilus.

The firft phyfician of eminence who differed confiderably in his practice from Hippocrates was Praxagoras. Cœlius Aurelianus acquaints us, that he made great ufe of vomits in his practice, infomuch as to exhibit them in the iliac paffion till the excrements were difcharged by the mouth. In this diftemper he alfo advifed, when all other means failed, to open the belly, cut the inteftine, take out the indurated fæces, and then to few up all again; but this practice has not probably been followed by any fubfequent phyfician. 30 Praxagoras.

Erafiftratus was a phyfician of great eminence, and flourifhed in the time of Seleucus, one of the fucceffors of Alexander the Great. According to Galen, he entirely banifhed venefection from medicine; though fome affirm that he did not totally difcard it, but only ufed it lefs frequently than other phyficians. His reafons for difapproving of venefection are as follow: It is difficult to fucceed in venefection, becaufe we cannot always fee the vein we intend to open, and becaufe we are not fure but we may open an artery inftead of a vein. We cannot afcertain the true quantity to be taken. If we take too little, the intention is by no means anfwered: if we take too much, we run a rifk of deftroying the patient. The evacuation of the venous blood alfo is 31 Erafiftratus.

Erasistratus. succeeded by that of the spirits, which on that occasion pass from the arteries into the veins. It must likewise be observed, that as the inflammation is formed in the arteries by the blood coagulated in their orifices, venesection must of course be useless and of no effect.

As Erasistratus did not approve of venesection, so neither did he of purgatives, excepting very rarely, but exhibited clysters and vomits; as did also his master Chrysippus. He was of opinion, however, that the clysters should be mild; and condemned the large quantity and acrid quality of those used by the ancients. The reason why purgatives were not much used by him was, that he imagined purging and venesection could answer no other purpose than diminishing the fulness of the vessels; and for this purpose he asserted that there were more effectual means than either phlebotomy or purging. He asserted that the humours discharged by cathartics were not the same in the body that they appeared after the discharge; but that the medicines changed their nature, and produced a kind of corruption in them. This opinion has since been embraced by a great number of physicians. He did not believe that purgatives acted by attraction; but substituted in the place of this principle what Mr Le Clerc imagines to be the same with Aristotle's *fuga vacui*. The principal remedy substituted by him in place of purging and venesection was abstinence. When this, in conjunction with clysters and vomits, was not sufficient to eradicate the disease, he then had recourse to exercise. All this was done with a view to diminish the plenitude, which, according to him, was the most frequent cause of all diseases. Galen also informs us, that Erasistratus had so great an opinion of the virtues of succory in diseases of the viscera and lower belly, and especially in those of the liver, that he took particular pains to describe the method of boiling it, which was, to boil it in water till it was tender; then to put it into boiling water a second time, in order to destroy its bitterness; afterwards to take it out of the water, and preserve it in a vessel with oil; and lastly, when it is to be used, add a little weak vinegar to it. Nay, so minute and circumstantial was Erasistratus with regard to the preparation of his favourite succory, that he gave orders to tie several of the plants together, because that was the more commodious method of boiling them. The rest of Erasistratus's medicines consisted almost entirely of regimen; to which he added some topical remedies, such as cataplasms, fomentations, and unctions. In short, as he could neither endure compounded medicines, nor superstitious and fine-spun reasonings, he reduced medicine to a very simple and compendious art.

With regard to surgery, Erasistratus appears to have been very bold; and as an anatomist he is said to have been exceedingly cruel, insomuch that he is represented by some as having dissected criminals while yet alive*. In a scirrhous liver, or in tumors of that organ, Cœlius Aurelianus observes, that Erasistratus made an incision through the skin and integuments, and having opened the abdomen he applied medicines immediately to the part affected. But tho' he was thus bold in performing operations on the liver, yet he did not approve of the paracentesis or tapping in the dropsy; because (said he) the waters being evacuated, the liver, which is inflamed and become hard like a stone, is more pressed by the adjacent parts which the waters kept at a distance from it, so that by this means the patient dies. He declared also against drawing teeth which were not loose; and used to tell those who talked with him on this operation, That in the temple of Apollo there was to be seen an instrument of lead for drawing teeth; in order to insinuate that we must not attempt the extirpation of any but such as are loose, and call for no greater force for their extirpation than what may be supposed in an instrument of lead.

* See Anatomy, *Hist.*

Herophilus, the disciple of Praxagoras, and cotemporary of Erasistratus, followed a less simple practice: 32 Herophilus.
he made so great use of medicines both simple and compound, that neither he nor his disciples would undertake the cure of any disorder without them. He seems also to have been the first who treated accurately of the doctrine of pulses, of which Hippocrates had but a superficial knowledge. Galen, however, affirms, that on this subject he involved himself in difficulties and advanced absurdities; which indeed we are not greatly to wonder at, considering the time in which he lived. He took notice of a disease at that time pretty rare, and to which he ascribes certain sudden deaths. He calls it a *palsy of the heart*; and perhaps it may be the same disease with what is now termed the *angina pectoris*.

According to Celsus, it was about this time that medicine was first divided into three branches, viz. the dietetic, the pharmaceutical, and the chirurgical medicine. The first of these employed a proper regimen in the cure of diseases; the second, medicines; and the third, the operation of the hands: and the same author informs us, that these three branches became now the business of as many distinct classes of men; so that from this time we may date the origin of the three professions of physicians, apothecaries, and surgeons.—Before this division, those called *physicians* discharged all the several offices belonging to the three professions; and there were only two kinds of them, viz. one called ἀρχιτεκτονικοι, who only gave their advice to the patients, and directions to those of an inferior class, who were called δημιουργοι, and worked with their hands either in the performing operations, or in the composition and application of remedies.

The first grand revolution which happened in the 33 The Empirics.
medicinal art after the days of Herophilus and Erasistratus was occasioned by the founding of the empiric sect by Serapion of Alexandria about 287 years before Christ. The division into dogmatists and empirics had indeed subsisted before; but about this time the 34 Serapion.
latter party began to grow strong, and to have champions publicly asserting its cause. Galen informs us, that Serapion used Hippocrates very ill in his writings, in which he discovered an excess of pride, self-sufficiency, and contempt for all the physicians that went before him. We have some sketches of his practice in Cœlius Aurelianus, from which we may infer that he retained the medicines of Hippocrates and the other physicians who went before him, tho' he rejected their reasoning. We know not what arguments he advanced for the support of his sentiments, since his works are lost, as well as those of the other empirics; and we should know nothing at all of any

Serapion. of them, if their adverſaries had not quoted them in order to confute them.

The empirics admitted only one general method of obtaining ſkill in the medical art, which was by experience, called by the Greeks ἐμπειρία. From this word they took their name, and refuſed to be called after the founder or any champion of their ſect. They defined experience a knowledge derived from the evidence of ſenſe. It was either fortuitous, or acquired by deſign. For acquiring practical ſkill they recommended what they called τήρησις, or one's own obſervation, and the reading of hiſtories or caſes faithfully related by others. Hence they thought that we are enabled to know a diſeaſe by its reſemblance to others; and, when new diſeaſes occurred, to conclude what was proper to be done from the ſymptoms they had in common with others that were before known. They aſſerted, that obſervation ought principally to be employed in two different ways; firſt in diſcovering what things are ſalutary, and what are of an indifferent nature; and, ſecondly, what particular diſeaſe is produced by a certain concurrence of ſymptoms; for they did not call every ſymptom a diſeaſe, but only ſuch a combination of them as from long experience they found to accompany each other, and produced ſuch diſorders as began and terminated in the ſame manner.

On the other hand, the dogmatiſt affirmed, that there was a neceſſity for knowing the latent as well as the evident cauſes of diſeaſes, and that the phyſician ought to underſtand the natural actions and functions of the human body, which neceſſarily preſuppoſes a knowledge of the internal parts. By ſecret or latent cauſes they meant ſuch as related to the elements or principles of which our bodies are compoſed, and which are the origin of a good or bad ſtate of health. They aſſerted that it was impoſſible to know how to cure a diſeaſe without knowing the cauſe whence it proceeded; becauſe undoubtedly it behoved them to vary prodigiouſly in themſelves according to the different cauſes by which they were produced.

35. Aſclepiades. The next remarkable perſon in the hiſtory of phyſic is Aſclepiades, who flouriſhed in the century immediately preceding the birth of Chriſt. He introduced the philoſophy of Democritus and Epicurus into medicine, and ridiculed the doctrines of Hippocrates. He aſſerted, that matter conſidered in itſelf was of an unchangeable nature; and that all perceptible bodies were compoſed of a number of ſmaller ones, between which there were interſperſed an infinity of ſmall ſpaces totally void of all matter. He thought that the ſoul itſelf was compoſed of theſe ſmall bodies. He laughed at the principle called *Nature* by Hippocrates, and alſo at the imaginary faculties ſaid by him to be ſubſervient to her; and ſtill more at what he called *Attraction*. This laſt principle Aſclepiades denied in every inſtance, even in that of the loadſtone and ſteel, imagining that this phenomenon proceeded from a concourſe of corpuſcles, and a particular diſpoſition or modification of their pores. He alſo maintained, that nothing happened or was produced without ſome cauſe; and that what was called *nature* was in reality no more than *matter* and *motion*. From this laſt principle he inferred that Hippocrates knew not what he ſaid when he ſpoke of Nature as an intelligent being, and aſcribed qualities of different kinds to her. For the ſame reaſon he ridiculed the doctrine of Hippocrates with regard to criſes; and aſſerted that the termination of diſeaſes might be as well accounted for from mere matter and motion. He maintained, that we were deceived if we imagined that nature always did good; ſince it was evident that ſhe often did a great deal of harm. As for the days particularly fixed upon by Hippocrates for criſes, or thoſe on which we uſually obſerve a change either for the better or the worſe, Aſclepiades denied that ſuch alterations happened on thoſe days rather than on others. Nay, he aſſerted that the criſis did not happen at any time of its own accord, or by the particular determination of nature for the cure of the diſorder, but that it depended rather on the addreſs and dexterity of the phyſician; that we ought never to wait till a diſtemper terminates of its own accord, but that the phyſician by his care and medicines muſt haſten on and advance the cure.—According to him, Hippocrates and other ancient phyſicians attended their patients rather with a view to obſerve in what manner they died than in order to cure them; and this under pretence that Nature ought to do all herſelf, without any aſſiſtance. Aſclepiades.

According to Aſclepiades, the particular aſſemblage of the various corpuſcles abovementioned, and repreſented as of different figures, is the reaſon why there are ſeveral pores or interſtices within the common maſs, formed by theſe corpuſcles; and why theſe pores are of a different ſize. This being taken for granted, as theſe pores are in all the bodies we obſerve, it muſt of courſe follow that the human body has ſome peculiar to itſelf, which, as well as thoſe of all other bodies, contain other minute bodies, which paſs and repaſs by thoſe pores that communicate with each other; and as theſe pores or interſtices are larger or ſmaller, ſo the corpuſcles which paſs through them differ proportionably as to largeneſs and minuteneſs. The blood conſiſts of the largeſt of theſe corpuſcles, and the ſpirits, or the heat, of the ſmalleſt.

From theſe principles he infers, that as long as the corpuſcles are freely received by the pores, the body remains in its natural ſtate; and on the contrary, it begins to recede from that ſtate, when the corpuſcles find any obſtacle to their paſſage. Health therefore depends on the juſt proportion between the pores and the corpuſcles they are deſtined to receive and tranſmit; as diſeaſes, on the contrary, proceed from a diſproportion between theſe pores and the corpuſcles. The moſt uſual obſtacle on this occaſion proceeds from the corpuſcles embracing each other, and being retained in ſome of their ordinary paſſages, whether theſe corpuſcles arrive in too large a number, are of irregular figures, move too faſt or too ſlow, &c.

Among the diſorders produced by the corpuſcles ſtopping of their own accord, Aſclepiades reckoned phrenſies, lethargies, pleuriſies and burning fevers. Pains, in particular, are claſſed among the accidents which derive their origin from a ſtagnation of the largeſt of all the corpuſcles of which the blood conſiſts. Among the diſorders produced by the bad ſtate and diſpoſition of the pores, he placed deliquiums, languors, extenuations, leanneſs, and dropſies. Theſe laſt diſorders he thought proceeded from the pores being too much relaxed and opened: the dropſy in par-

Asclepiades particular, he thinks, proceeds from the flesh being perforated with various small holes, which convert the nourishment received into them into water. Hunger, and especially that species of it called *fames canina*, proceeds from an opening the of large pores of the stomach and belly; and thirst from an opening of their small ones. Upon the same principles he accounted for intermittent fevers. Quotidian fevers are caused by a retention of the largest corpuscles, those of the tertian kind by a retention of corpuscules somewhat smaller, and quartan fevers are produced by a retention of the smallest corpuscles of all.

The practice of Asclepiades was suited to remove these imaginary causes of disorders. He composed a book concerning common remedies, which he principally reduced to three, *viz.* gestation, friction, and the use of wine. By various exercises he proposed to render the pores more open, and to make the juices and small bodies, which cause diseases by their retention, pass more freely; and while the former physicians had not recourse to gestation till towards the end of long continued disorders, and when the patients, tho' entirely free from fever, were yet too weak to take sufficient exercise by walking, Asclepiades used gestation from the very beginning of the most burning fevers. He laid it down as a maxim, that one fever was to be cured by another; that the strength of the patient was to be exhausted by making him watch and endure thirst to such a degree, that, for the two first days of the disorder, he would not allow them to cool their mouths with a drop of water. Celsus also observes, that though Asclepiades treated his patients like a butcher during the first days of the disorder, he indulged them so far afterwards as even to give directions for making their beds in the softest manner. On several occasions Asclepiades used frictions to open the pores. The dropsy was one of the distempers in which this remedy was used; but the most singular attempt was, by this means, to lull phrenetic patients asleep. But though he enjoined exercise so much to the sick, he denied it to those in health; a piece of conduct not a little surprising and extraordinary. He allowed wine freely to patients in fevers, provided the violence of the distemper was somewhat abated. Nor did he forbid it to those who were afflicted with a phrenzy: nay, he ordered them to drink it till they were intoxicated, pretending by that means to make them sleep; because, he said, wine had a narcotic quality and procured sleep, which he thought absolutely necessary for those who laboured under that disorder. To lethargic patients he used it on purpose to excite them, and rouse their senses: he also made them smell strong-scented substances, such as vinegar, castor, and rue, in order to make them sneeze; and applied to their heads cataplasms of mustard made up with vinegar.

Besides these remedies, Asclepiades enjoined his patients abstinence to an extreme degree. For the first three days, according to Celsus, he allowed them no aliment whatever; but on the fourth began to give them victuals. According to Cælius Aurelianus, however, he began to nourish his patients as soon as the accession of the disease was diminished, not waiting till an entire remission; giving to some aliments on the first, to others on the second, to others on the third, and so on to the seventh day. It seems almost incredible to us, that people should be able to fast till this last mentioned term; but Celsus assures us, that abstinence till the seventh day was enjoined by the predecessors of Asclepiades, and by Heraclides Tarentinus. Asclepiades

The next great revolution which happened in the medicinal art, was brought about by Themison, the disciple of Asclepiades, who lived not long before the time of Celsus, during the end of the reign of Augustus, or beginning of that of Tiberius. The sect founded by him was called *methodic*, because he endeavoured to find a method of rendering medicine more easy than formerly. 36 Methodic sect.

He maintained, that a knowledge of the causes of diseases was not necessary, provided we have a due regard to what diseases have in common and analogous to one another. In consequence of this principle, he divided all diseases into two, or at most three, kinds. The first included diseases arising from stricture; the second, those arising from relaxation; and the third, those of a mixed nature, or such as partook both of stricture and relaxation. 37 Themison.

Themison also asserted, that diseases are sometimes acute, and sometimes chronical; that for a certain time they increase; that at a certain time they are at their height; and that at last they were observed to diminish. Acute diseases, therefore, according to him, must be treated in one way, and chronical ones in another; one method must be followed with such as are in their augmentation, another with such as are at their height, and a third with such as are in their declension. He asserted, that the whole of medicine consisted in the observation of that small number of rules which are founded upon things altogether evident. He said, that all disorders, whatever their nature was, if included under any of the kinds above mentioned, ought to be treated precisely in the same way, in whatever country and with whatever symptoms they happen to arise. Upon these principles, he defined medicine to be a method of conducting to the knowledge of what diseases have in common with each other, and which at the same time is evident.

Themison was old when he laid the foundation of the Methodic sect; and it was only brought to perfection by Thessalus, who lived under the emperor Nero. 38 Thessalus. Galen and Pliny accuse this physician of intolerable insolence and vanity, and report that he gave himself the air of despising all other physicians; and so intolerable was his vanity, that he assumed the title of *the conqueror of physicians*, which he caused to be put upon his tomb in the Appian way. Never was mountebank (says Pliny) attended by a greater number of spectators than Thessalus had generally about him; and this circumstance is the less to be wondered at, if we consider that he promised to teach the whole art of medicine in less than six months. In reality, the art might be learned much sooner if it comprehended no more than what the methodists thought necessary: for they cut off the examination of the causes of diseases followed by the dogmatics; and substituted in the room of the laborious observations of the empirics, indications drawn from the analogy of diseases, and the mutual resemblance they bear to each other. The most skilful of all the methodic sect, and he who put the last hand to it, was Soranus. He lived under the emperors Trajan and Adrian, and was a native of Ephesus. 39 Soranus.

40 Celsus. One of the most celebrated medical writers of antiquity

Celsus. tiquity was Celsus, whom we have already had occasion to mention. Most writers agree that he lived in the time of Tiberius, but his country is uncertain. It is even disputed whether or not he was a professed physician. Certain it is, however, that his books on medicine are the most valuable of all the ancients next to those of Hippocrates. From the latter, indeed, he has taken so much, as to acquire the name of the *Latin Hippocrates;* but he has not attached himself to him so closely as to reject the assistance of other authors. In many particulars he has preferred Asclepiades. With him he laughs at the critical days of Hippocrates, and ascribes the invention of them to a foolish and superstitious attachment to the Pythagorean doctrine of numbers. He also rejected the doctrine of Hippocrates with regard to venesection, of which he made a much more general use; but did not take away so much at a time, thinking it much better to repeat the operation than weaken the patient by too great an evacuation at one time. He used cupping also much more frequently, and differed from him with regard to purgatives. In the beginning of disorders, he said, the patients ought to endure hunger and thirst: but afterwards they were to be nourished with good aliments; of which, however, they were not to take too much, nor fill themselves all of a sudden, after having fasted. He does not specify how long the patient ought to practise abstinence; but affirms, that in this particular it is necessary to have a regard to the disease, the patient, the season, the climate, and other circumstances of a like nature. The signs drawn from the pulse he looked upon to be very precarious and uncertain. "Some (says he) lay great stress upon the beating of the veins or the arteries; which is a deceitful circumstance, since that beating is slow or quick, and varies very much, according to the age, sex, and constitution of the patient. It even sometimes happens that the pulse is weak and languid when the stomach is disordered, or in the beginning of a fever, though in other respects the body be in a good state; so that we might, in this latter case, be induced to believe, that a man is very weak, when he is just entering into a violent paroxysm, has strength enough left, and may be easily recovered from it. On the contrary, the pulse is often high, and in a violent commotion, when one has been exposed to the sun, or comes out of a bath, or from using exercise; or when one is under the influence of anger, fear, or any other passion. Besides, the pulse is easily changed by the arrival of the physician, in consequence of the patient's anxiety to know what judgement he will pass upon his case. To prevent this, the physician must not feel the patient's pulse on his first arrival: he must first sit down by him, assume a chearful air, inform himself of his condition; and if he is under any dread, endeavour to remove it by encouraging discourse; after which he may examine the beating of the artery. This nevertheless does not hinder us from concluding, that if the sight of the physician alone can produce so remarkable a change in the pulse, a thousand other causes may produce the same effect." But although Celsus thought for himself, and in not a few particulars differed from his predecessors, yet in his writings, which are not only still preserved, but have gone through almost innumerable editions, we have a compendious view of the practice of almost all his predecessors: and he treats of the healing art in all its branches, whether performed *manu, victu, vel medicamentis.* His writings, therefore, will naturally be had recourse to by every one who wishes either to become acquainted with the practice of the ancients prior to the fall of the Roman empire, or to read medical Latin in its greatest purity.

41 Galen.

About the 131st year after Christ, in the reign of the emperor Adrian, lived the celebrated Galen, a native of Pergamus, whose name makes such a conspicuous figure in the history of physic. At this time the dogmatic, empiric, methodic, and other sects, had each their abettors. The methodics were held in great esteem, and looked upon to be superior to the dogmatics, who were strangely divided among themselves, some of them following Hippocrates, others Erasistratus, and others Asclepiades. The empirics made the least considerable figure of any. Galen undertook the reformation of medicine, and restored dogmatism. He seems to have been of that sect which was called *eclectic,* from their choosing out of different authors what they esteemed good in them, without being particularly attached to any one more than the rest. This declaration he indeed sets out with; but, notwithstanding this, he follows Hippocrates much more than any of the rest, or rather follows nobody else but him. Though before his time several physicians had commented on the works of Hippocrates, yet Galen pretends that none of them had understood his meaning. His first attempt therefore was to explain the works of Hippocrates; with which view he wrote a great deal, and after this set about composing a system of his own. In one of his books entitled, "Of the establishment of medicine," he defines the art to be one which teaches to preserve health and cure diseases. In another book, however, he proposes the following definition: "Medicine (says he) is a science which teaches what is sound, and what is not so; and what is of an indifferent nature, or holds a medium between what is sound and what is the reverse." He affirmed, that there are three things which constitute the object of medicine, and which the physician ought to consider as sound, as not sound, or of a neutral and indifferent nature. These are the body itself, the signs, and the causes. He esteems the human body sound, when it is in a good state or habit with regard to the simple parts of which it is composed, and when besides there is a just proportion between the organs formed of these simple parts. On the contrary, the body is reckoned to be unsound, when it recedes from this state, and the just proportion above mentioned. It is in a state of neutrality or indifference, when it is in a medium between soundness and its opposite state. The salutary signs are such as indicate present health, and prognosticate that the man may remain in that state for some time to come. The insalubrious signs, on the contrary, indicate a present disorder, or lay a foundation for suspecting the approach of one. The neutral signs, or such as are of an indifferent nature, denote neither health nor indisposition, either for the present, or for the time to come. In like manner he speaks of causes salutary, unsalutary, and indifferent.

These three dispositions of the human body, that is, soundness, its reverse, and a neutral state, comprehend all the differences between health and disorder or indispo-

Galen. diſpoſition: and each of theſe three ſtates or diſpoſitions has a certain extent peculiar to itſelf. A ſound habit of body, according to the definition of it already given, is very rare, and perhaps never to be met with; but this does not hinder us to ſuppoſe ſuch a model for regulating our judgment with reſpect to different conſtitutions. On this principle Galen eſtabliſhes eight other principal conſtitutions, all of which differ more or leſs from the perfect model abovementioned. The four firſt are ſuch as have one of the four qualities of hot, cold, moiſt, or dry, prevailing in too great a degree; and accordingly receive their denomination from that quality which prevails over the reſt. The four other ſpecies of conſtitutions receive their denominations from a combination of the abovementioned; ſo that, according to his definition, there may be a hot and dry, a hot and moiſt, a cold and moiſt, and a cold and dry, conſtitution. Beſides theſe differences, there are certain others which reſult from ocult and latent cauſes, and which, by Galen, are ſaid to ariſe from an *idioſyncraſy* of conſtitution. It is owing to this idioſyncraſy that ſome have an averſion to one kind of aliment and ſome to another; that ſome cannot endure particular ſmells, &c. But though theſe eight laſt-mentioned conſtitutions fall ſhort of the perfection of the firſt, it does not thence follow, that thoſe to whom they belong are to be claſſed among the valetudinary and diſeaſed. A diſeaſe only begins when the deviation becomes ſo great as to hinder the action of the parts.

Galen deſcribes at great length the ſigns of a good or bad conſtitution, as well as thoſe of what he calls a *neutral habit*. Theſe ſigns are drawn from the original qualities of cold, hot, moiſt, and dry, and from their juſt proportion or diſproportion with reſpect to the bulk, figure, and ſituation, of the organical parts. With Hippocrates he eſtabliſhes three principles of an animal body; the parts, the humours, and the ſpirits. By the parts he properly meant no more than the ſolid parts; and theſe he divided into ſimilar and organical. Like Hippocrates, he alſo acknowledged four humours; the blood, the phlegm, the yellow bile and black bile. He eſtabliſhed three different kinds of ſpirits; the vital, the animal, and the natural. The firſt of theſe are, according to him, nothing elſe but a ſubtle vapour ariſing from the blood, which draws its origin from the liver, the organ or inſtrument of ſanguification. After theſe ſpirits are conveyed to the heart, they, in conjunction with the air we draw into the lungs, become the matter of the ſecond ſpecies, that is, of the vital ſpirits, which are again changed into thoſe of the animal kind in the brain. He ſuppoſed that theſe three ſpecies of ſpirits ſerved as inſtruments to three kinds of faculties, which reſide in the reſpective parts where theſe faculties are formed. The natural faculty is the firſt of theſe, which he placed in the liver, and imagined to preſide over the nutrition, growth, and generation, of the animal. The vital faculty he lodged in the heart, and ſuppoſed that by means of the arteries it communicated warmth and life to all the body. The animal faculty, the nobleſt of all the three, and with which the reaſoning or governing faculty was joined, according to him, has its ſeat in the brain; and, by means of the nerves, diſtributes a power of motion and ſenſation to all the parts, and preſides over all the other faculties. The original ſource or principle of motion in all theſe faculties, Galen, as well as Hippocrates, defines to be *Nature*. Galen.

Upon theſe principles Galen defined a diſeaſe to be "ſuch a preternatural diſpoſition or affection of the parts of the body, as primarily, and of itſelf, hinders their natural and proper action." He eſtabliſhed three principal kinds of diſeaſes: the firſt relates to the ſimilar parts; the ſecond, to the organical; and the third is common to both theſe parts. The firſt kind of diſeaſes conſiſts in the intemperature of the ſimilar parts; and this is divided into an intemperature *without matter*, and an intemperature *with matter*. The firſt diſcovers itſelf when a part has more or leſs heat or cold than it ought to have without that change of quality in the part being ſupported and maintained by any matter. Thus, for inſtance, a perſon's head may be overheated and indiſpoſed by being expoſed to the heat of the ſun, without that heat being maintained by the continuance or congeſtion of any hot humour in the part. The ſecond ſort of intemperature is when any part is not only rendered hot or cold, but alſo filled with a hot or cold humour, which are the cauſes of the heat or cold felt in the part. Galen alſo acknowledged a ſimple intemperature: that is, when one of the original qualities, ſuch as heat or cold, exceeds alone and ſeparately; and a compound intemperature, when two qualities are joined together, ſuch as heat and dryneſs, or coldneſs and humidity. He alſo eſtabliſhed an equal and unequal temperature. The former is that which is equally in all the body, or in any particular part of it, and which creates no pain, becauſe it is become habitual, ſuch as dryneſs in the hectic conſtitution. The latter is diſtinguiſhed from the former, in that it does not equally ſubſiſt in the whole of the body, or in the whole of a part. Of this kind of intemperature we have examples in certain fevers, where heat and cold, equally, and almoſt at the ſame time, attack the ſame part; or in other fevers, which render the ſurface of the body cold as ice, while the internal parts burn with heat; or laſtly, in caſes where the ſtomach is cold and the liver hot.

The ſecond kind of diſorders, relating to the organical parts, reſults from irregularities of theſe parts, with reſpect to the number, bulk, figure, ſituation, &c.; as when one has ſix fingers, or only four; when one has any part larger or ſmaller than it ought to be, &c. The third kind, which is common both to the ſimilar and the organical parts, is a ſolution of continuity, which happens when any ſimilar or compound part is cut, bruiſed, or corroded.

Like Hippocrates, Galen diſtinguiſhed diſeaſes into acute and chronical; and, with reſpect to their nature and genius, into benign and malignant; alſo into epidemic, endemic, and ſporadic.

After having diſtinguiſhed the kinds of diſeaſes, Galen comes to explain the cauſes; which he divides into external and internal. The external cauſes of diſeaſes, according to him, are ſix things, which contribute to the preſervation of health when they are well diſpoſed and properly uſed, but produce a contrary effect when they are imprudently uſed or ill diſpoſed. Theſe ſix things are, the air, aliments and drink, motion and reſt, ſleeping and watching, retention and excretion, and laſtly the paſſions. All theſe are called the *procatarctic* or *beginning* cauſes, becauſe they put in

Galen.

in motion the internal cauſes; which are of two kinds, the *antecedent* and the *conjunct*. The former is diſcovered only by reaſoning; and conſiſts for the moſt part in a peccancy of the humours, either by plenitude or cacochymy, *i. e.* a bad ſtate of them. When the humours are in too large a quantity, the caſe is called a *plethora;* but we muſt obſerve, that this word equally denotes too large a quantity of all the humours together, or a redundance of one particular humour which prevails over the reſt. According to theſe principles, there may be a ſanguine, a bilious, a pituitous, or a melancholy plenitude: but there is this difference between the ſanguine and the three other plenitudes, that the blood, which is the matter of the former, may far ſurpaſs the reſt: whereas, if any of the three laſt mentioned ones do ſo, the caſe is no longer called *plenitude*, but *cacockymy;* becauſe theſe humours, abounding more than they ought, corrupt the blood. The cauſes he alſo divides into ſuch as are manifeſt and evident, and ſuch as are latent and obſcure. The firſt are ſuch as ſpontaneouſly come under the cognizance of our ſenſes when they act or produce their effects: the ſecond are not of themſelves perceptible, but may be diſcovered by reaſoning: the third ſort, *i. e.* ſuch as he calls *occult* or *concealed*, cannot be diſcovered at all. Among this laſt he places the cauſe of the hydrophobia.

He next proceeds to conſider the ſymptoms of diſeaſes. A ſymptom he defines to be "a preternatural affection depending upon a diſeaſe, or which follows it as a ſhadow does a body." He acknowledged three kinds of ſymptoms: the firſt and moſt conſiderable of theſe conſiſted in the action of the parts being injured or hindered; the ſecond in a change of the quality of the parts, their actions in the mean time remaining entire; the third related to defects in point of excretion and retention.

After having treated of ſymptoms, Galen treats of the *ſigns* of diſeaſes. Theſe are divided into *diagnoſtic* and *prognoſtic*. The firſt are ſo called becauſe they enable us to know diſeaſes, and diſtinguiſh them from each other. They are of two ſorts, *pathognomonic* and *adjunct*. The firſt are peculiar to every diſeaſe, make known its preciſe ſpecies, and always accompany it, ſo that they begin and end with it. The ſecond are common to ſeveral diſeaſes, and only ſerve to point out the difference between diſeaſes of the ſame ſpecies. In a pleuriſy, for inſtance, the pathognomonic ſigns are a cough, a difficulty of breathing, a pain of the ſide, and a continued fever; the adjunct ſigns are the various ſorts of matter expectorated, which are ſometimes bloody, ſometimes bilious, &c. —The diagnoſtic ſigns were drawn from the defective or diſordered diſpoſition of the parts, or from the diſeaſes themſelves; ſecondly, from the cauſes of diſeaſes; thirdly, from their ſymptoms; and laſtly, from the particular diſpoſitions of each body, from things which prove prejudicial and thoſe that do ſervice, and from epidemical diſeaſes.—The prognoſtic ſigns he gathered from the ſpecies, virulence, and peculiar genius of the diſeaſe: but as we have already ſoken ſo largely concerning the prognoſtics of Hippocrates, it is ſuperfluous to be particular on thoſe of Galen.—His method of cure differed little from that of Hippocrates: but from the ſpecimen already given of Galen's method of teaching the medical art, it is evident that his ſyſtem was little elſe than a collection of ſpeculations, diſtinctions, and reaſonings; whereas that of Hippocrates was founded immediately upon facts, which he had either obſerved himſelf, or had learned from the obſervation of others.

The ſyſtem of Galen, however, notwithſtanding its defects and abſurdities, remained almoſt uncontradicted for a very long period. Indeed it may be conſidered as having been the prevailing ſyſtem till the inundation of the Goths aud Vandals put an almoſt entire ſtop to the cultivation of letters in Europe. But during the general prevalence of the ſyſtem of Galen, there appeared ſome writers to whom medicine was indebted for improvements, at leaſt in certain particulars. Among the moſt diſtinguiſhed of theſe we may mention Oribaſius, Ætius, Alexander, and Paulus.

42 Oribaſius.

Oribaſius flouriſhed about the year 360, and was phyſician to the emperor Julian. He ſpeaks very fully of the effects of bleeding by way of ſcarification, a thing little taken notice of by former writers; from his own experience he aſſures us that he had found it ſucceſsful in a ſuppreſſion of the menſes, defluxions of the eyes, headach, and ſtraitneſs of breathing even when the perſon was extremely old. He tells his own caſe particularly, when the plague raged in Aſia, and he himſelf was taken ill, that the ſecond day he ſcarified his leg, and took away two pounds of blood; by which means he entirely recovered, as did ſeveral others who uſed it. In this author alſo we find the firſt deſcription of a ſurpriſing and terrible diſtemper, which he termed λυκανθρωπια, a ſpecies of melancholy and madneſs, which he deſcribes thus. "The perſons affected get out of their houſes in the night-time, and in every thing imitate wolves, and wander among the ſepulchres of the dead till day-break. You may know them by theſe ſymptoms: Their looks are pale; their eyes heavy, hollow, dry, without the leaſt moiſture of a tear; their tongue exceedingly parched and dry, no ſpittle in their mouth, extreme thirſt; their legs, from the falls and the bruiſes they receive, full of incurable ſores and ulcers."

43 Ætius.

Ætius lived very near the end of the fifth, or in the beginning of the ſixth century. Many paſſages in his writings ſerve to ſhow us how much the actual and potential cautery were uſed by the phyſicians of that age. In a palſy, he ſays, that he ſhould not at all heſitate to make an eſchar either way, and this in ſeveral places; one in the nape, where the ſpinal marrow takes its riſe, two on each ſide of it; three or four on the top of the head, one juſt in the middle, and three others round it. He adds, that in this caſe, if the ulcers continue running a good while, he ſhould not doubt of a perfect recovery. He is ſtill more particular when he comes to order this application for an inveterate aſthma, after all other remedies have been tried in vain. One, he ſays, ſhould be made on each ſide near the middle of the joining of the clavicle, taking care not to touch the wind-pipe: two other little ones are then to be made near the carotids under the chin, one on each ſide, ſo that the cauſtic may penetrate no further than the ſkin; two others under the breaſts, between the third and fourth ribs; and again, two more backwards towards the fifth and ſixth ribs. Beſides theſe there ought to be one in the

Ætius. middle of the thorax near the beginning of the xiphoid cartilage over the orifice of the ftomach; one on each fide between the eighth and ninth ribs; and three others in the back, one in the middle, and the two others juft below it, on each fide of the vertebræ. Thofe below the neck ought to be pretty large, not very fuperficial, not very deep: and all thefe ulcers fhould be kept open for a very long time.

Ætius takes notice of the worms bred in different parts of the body called *dracunculi*, which were unknown to Galen. He feems alfo to be the firft Greek writer among the Chriftians, who gives us any fpecimen of medicinal fpells and charms; fuch as that of a finger of St Blafius for removing a bone which fticks in the throat, and another in relation to a fiftula. He gives a remedy for the gout, which he calls the *grand drier;* the patient is to ufe it for a whole year, and obferve the following diet each month. "In September, he muft eat and drink milk: In October, he muft eat garlic; in November, abftain from bathing; in December, he muft eat no cabbage; in January, he is to take a glafs of pure wine in the morning; in February, to eat no beet; in March, to mix fweet things both in eatables and drinkables; in April, not to eat horfe-radifh, nor in May the fifh called *polypus;* in June, he is to drink cold water in a morning; in July, to avoid venery; and laftly, in Auguft, to eat no mallows." This may fufficiently fhow the quackery of thofe times, and how fuperftition was beginning to mix itfelf with the art.

44 Alexander. Alexander, who flourifhed in the reign of Juftinian, is a more original author than either of the two former. He confines himfelf directly to the defcribing the figns of difeafes, and the methods of cure, without meddling with anatomy, the materia medica, or furgery, as all the reft did. He employs a whole book in treating of the gout. One method he takes of relieving this difeafe is by purging; and in moft of the purges he recommends hermodactyls, of which he has a great opinion. In a caufus, or burning fever, where the bile is predominant, the matter fit for evacuation, and the fever not violent, he prefers purging to bleeding, and fays that he has often ordered purging in acute fevers with furprifing fuccefs. In the caufus alfo, if a fyncope happens from crude and redundant humours, he recommends bleeding. In a fyncope fucceeding the fuppreffion of any ufual evacuation, he recommends bleeding, with frictions. The diagnoftics upon which he founds this practice are the following: viz. a face paler and more fwelled than ufual, a bloated habit of body, with a little fluggifh pulfe, having long intervals between the ftrokes. In tertian, and much more in quartan fevers, he recommends vomits above all other remedies, and affirms that by this remedy alone he has cured the moft inveterate quartans. On the bulimus, or canine appetite, he makes a new obfervation, viz. that it is fometimes caufed by worms. He mentions the cafe of a woman who laboured under this ravenous appetite, and had a perpetual gnawing at her ftomach and pain in her head: after taking *hiera*, fhe voided a worm above a dozen of cubits long, and was entirely cured of her complaints.—He is alfo the firft author who takes notice of *rhubarb;* which he recommends in a weaknefs of the liver and dyfentery.—Alexander is recommended by Dr Freind as one of the beft practical writers among the ancients, and well worthy the perufal of any modern. Alexander.

45 Paulus. Paulus was born in the ifland Ægina, and lived in the 7th century. He tranfcribes a great deal from Alexander and other phyficians. His defcriptions are fhort and accurate. He treats particularly of womens diforders; and feems to be the firft inftance upon record of a profeffed *man-midwife*, for fo he was called by the Arabians: and accordingly he begins his book with the diforders incident to pregnant women. He treats alfo very fully of furgery; and gives fome directions, according to Dr Freind, not to be found in the more ancient writers.

46 Arabian Phyficians. After the downfal of the Roman empire, and when the inundation of Goths and Vandals had almoft completely exterminated literature of every kind in Europe, medicine, though a practical art, fhared the fame fate with more abftract fciences. Learning in general, banifhed from the feat of arms, took refuge among the eaftern nations, where the arts of peace ftill continued to be cultivated. To the Arabian phyficians, as they have been called, we are indebted both for the prefervation of medical fcience, as it fubfifted among the Greeks and Romans, and likewife for the defcription of fome new difeafes, particularly the fmall-pox. Among the moft eminent of the Arabians, we may mention Rhafes, Avicenna, Albucafis, and Avenzoar. But of their writings it would be tedious, and is unneceffary to give any particular account.—They were for the moft part, indeed, only copiers of the Greeks; we are, however, indebted to them for fome improvements. They were the firft who introduced chemical remedies, though of thefe they ufed but few, nor did they make any confiderable progrefs in the chemical art. Anatomy was not in the leaft improved by them, nor did furgery receive any advancement till the time of Albucafis, who lived probably in the 12th century. They added a great deal to botany and the materia medica, by the introduction of new drugs, of the aromatic kind efpecially, from the eaft, many of which are of confiderable ufe. They alfo found out the way of making fugar; and by help of that, fyrups; which two new materials are of great ufe in mixing up compound medicines. 47 Rhafes.

With regard to their practice, in fome few particulars they deviated from the Greeks. Their purging medicines were much milder than thofe formerly in ufe; and even when they did prefcribe the old ones, they gave them in a much lefs dofe than formerly. The fame reflection may be made concerning their manner of bleeding, which was never to that exceffive degree practifed by the Greeks. They deviated from Hippocrates, however, in one very trivial circumftance, which produced a violent controverfy. The queftion was, Whether blood in a pleurify ought to be drawn from the arm of the affected fide or the oppofite? Hippocrates had directed it to be drawn from the arm of the affected fide; but the Arabians, following fome other ancient phyficians, ordered it to be drawn from the oppofite one. Such was the ignorance of thofe ages, that the univerfity of Salamanca in Spain made a decree, that no one fhould dare to let blood but in the contrary arm; and endeavoured to procure an edict from the emperor Charles V. to fecond it;

Arabian Physicians.

it; alleging that the other method was of no less pernicious consequence to medicine, than Luther's heresy had been to religion.

In consequence of the general decay of learning in the western parts of the world, the Greek writers became totally forgot, because nobody could read the language; and the Arabians, though mostly copiers from them, enjoyed all the reputation that was due to the others. The Arabian physic was introduced into Europe very early, with the most extravagant applause: and not only this, but other branches of their learning, came into repute in the west; insomuch that in the 11th century, the studies of natural philosophy and the liberal arts were called *the studies of the Saracens*. This was owing partly to the crusades undertaken against them by the European princes; and partly to the settlement of the Moors in Spain, and the intercourse they and other Arabians had with the Italians. For, long before the time of the crusades, probably in the middle of the 7th century, there were Hebrew, Arabic, and Latin professors of physic settled at Salernum: which place soon grew into such credit, that Charles the Great thought proper to found a college there in the year 802; the only one at that time in Europe.

48 College of Salernum.

49 Constantine.

Constantine the African flourished here towards the latter end of the 11th century. He was a native of Carthage; but travelled into the east, and spent 30 years in Babylon and Bagdad, by which means he became master of the oriental languages and learning. He returned to Carthage; but being informed of an attempt against his life, made his escape into Apulia, where he was recommended to Robert Guiscard, created in 1060 duke of that country, who made him his secretary. He was reputed to be very well versed in the Greek, as well as the eastern tongues; and seems to have been the first who introduced either the Greek or Arabian physic into Italy. His works, however, contain nothing that is new, or material; though he was then counted a very learned man, and for that age no doubt was so.

50 State of medicine in the 15th and 16th centuries.

From this time to the end of the 15th and beginning of the 16th century, the history of physic furnishes us with no interesting particulars. This period, however, is famous for the introduction of chemistry into medicine, and the description of three new distempers, the sweating sickness, the venereal disease, and the scurvy.

51 Sweating sickness in England.

The sweating sickness began in 1483, in the army of Henry VII. upon his landing at Milford-haven, and spread itself at London from the 21st of September to the end of October. It returned here five times, and always in summer; first in 1485, then in 1506, afterwards in 1517, when it was so violent that it killed many in the space of three hours, so that numbers of the nobility died, and of the commonalty in several towns often the one half perished. It appeared the fourth time in 1528, and then proved mortal in six hours; many of the courtiers died of it, and Henry VIII. himself was in danger. In 1529, and only then, it infested the Netherlands and Germany, in which last country it did much mischief. The last return of it was in 1551, and in Westminster it carried off 120 in a day. Dr Caius describes it as a pestilent contagious fever, of the duration of one natural day; the sweat he reckoned to be only a natural symptom, or crisis of the distemper. It first affected some particular part, attended with inward heat and burning, unquenchable thirst, restlessness, sickness at stomach, but seldom vomiting, headach, delirium, then faintness, and excessive drowsiness. The pulse was quick and vehement, and the breath short and laborious.—Children, poor and old people, were less subject to it. Of others, scarce any escaped the attack, and most of them died. Even by travelling into France or Flanders they did not escape; and what is still more strange, the Scots were said not to be affected: abroad the English only were seized, and foreigners in England were free. At first the physicians were much puzzled how to treat this disease. The only cure they ever found, however, was to carry on the sweat for a long time; for, if stopped, it was dangerous or fatal. The way, therefore, was for the patient to lie still, and not expose himself to cold. If nature was not strong enough to force out the sweat, it was necessary to assist her by art, with cloaths, wine, &c. The violence of the distemper was over in 15 hours; but there was no security for the patient till 24 were passed. In some strong constitutions there was a necessity to repeat the sweating, even to 12 times. The removing out of bed was attended with great danger; some who had not sweated enough fell into very ill fevers.—No flesh-meat was to be allowed in all the time of the distemper; nor drink for the first five hours. In the seventh, the distemper increased; in the ninth the delirium came on, and sleep was by all means to be avoided. However terrible this distemper appeared at first, it seldom proved obstinate, if treated in the above-mentioned manner.

Moderns.

In the beginning of the 16th century, the famous chemist Paracelsus introduced a new system into medicine, founded on the principles of his art. 52 Paracelsus.

The Galenical system had prevailed till his time; but the practice had greatly degenerated, and was become quite trifling and frivolous. The physicians rejected the use of opium, mercury, and other efficacious remedies. Paracelsus, who made use of these, had therefore greatly the advantage over them; and now all things relating to medicine were explained on imaginary chemical principles. It will easily be conceived that a practice founded in this manner could be no other than the most dangerous quackery. At this time, however, it was necessary; for now a new disease over-ran the world, and threatened greater destruction than almost all the old ones put together, both by the violence of its symptoms, and its baffling the most powerful remedies at that time known.—This was the venereal disease, which is said to have been imported from the West-Indies by the companions of Christopher Columbus. Its first remarkable appearance was at the siege of Naples in 1494, from whence it was soon after propagated through Europe, Asia, and Africa. 53 Appearance of the venereal disease.

The symptoms with which it made the attack at that time were exceedingly violent, much more so than they are at present; and consequently were utterly unconquerable by the Galenists. The quacks and chemists, who boldly ventured on mercury, though they no doubt destroyed numbers by their excessive use of it, yet showed that a remedy for this terrible distemper was at last found out, and that a proper method of treating it might soon be fallen upon. Shortly after, the West-Indian specific, guaiacum,

cum. was discovered: the materia medica was enriched with that and many other valuable medicines, both from the East and West-Indies: which contributed considerably to the improvement of the practice of physic. At this period, as sea voyages of considerable duration became more frequent, the scurvy became a more frequent distemper, and was of course more accurately described. But probably, from supposed analogy to the contagious which at that time were new in Europe, very erroneous ideas were entertained with regard to its being of an infectious nature: And it is not impossible, that from its being attended also with ulcers, it was on some occasions confounded with syphilitic complaints.

54 Progress of medicine in the 17th and 18th centuries.

The revival of learning, which now took place throughout Europe, the appearance of these new distempers, and the natural fondness of mankind for novelty, contributed greatly to promote the advancement of medicine as well as other sciences. While at the same time, the introduction of the art of printing rendered the communication of new opinions as well as new practices so easy a matter, that to enumerate even the names of those who have been justly rendered eminent for medical knowledge would be a very tedious task. It was not, however, till 1628 that Dr William Harvey of London demonstrated and communicated to the public one of the most important discoveries respecting the animal economy, the circulation of the blood. This discovery, more effectually than any reasoning, overturned all the systems which had subsisted prior to that time.

55 Discovery of the circulation.

It may justly be reckoned the most important discovery that has hitherto been made in the healing art: for there can be no doubt that it puts the explanation of the phenomena of the animal body, both in a state of health and disease, on a more solid and rational footing than formerly. It has not, however, prevented the rise of numerous fanciful and absurd systems. These, though fashionable for a short time, and strenuously supported by blind adherents, have yet in no long period fallen into deserved contempt. And notwithstanding the abilities and industry of Stahl, Hoffman, Boerhaave, and Cullen, we may easily venture to assert that no general system has yet been proposed which is not liable to innumerable and unsurmountable objections. Very great progress has indeed been made in explaining the philosophy of the human body, from ascertaining by decisive experiment the influence of the circulating, the nervous, and the lymphatic systems in the animal economy. But every attempt hitherto made to establish any general theory in medicine, that is to conduct the cure of every disease on a few general principles, has equally deviated from truth with those of Hippocrates and Galen; and has equally tended to mislead those who have adopted it. Indeed we may with confidence venture to assert, that from the very nature of the subject itself, medicine does not admit of such simplicity. No one can deny that the human body consists of a very great number of different parts, both solids and fluids. It is, however, equally certain, that each of these is from many different causes liable to deviations from the sound state. And although some slight changes may take place without what can be called a morbid affection, yet we well know, that every change taking place to a certain degree in any one part will necessarily and unavoidably produce an affection of the whole. Hence we may without hesitation venture to affirm, that every general theory which can be proposed, attempting to explain the phenomena, and conduct the cure of all diseases on a few general principles, though for some time it may have strenuous advocates, will yet in the end be found to be both ill-grounded and pernicious.

The art of medicine has been much more usefully improved by careful attention to the history, theory, and practice of particular diseases, and by endeavouring to ascertain from cautious observation the symptoms by which they are to be distinguished, the causes by which they are induced, and the means by which they are to be prevented, alleviated, or cured. On this footing, therefore, we shall endeavour to give a brief account of at least the most important affections to which the human body is subjected, delivering what appear to us to be the best established facts and observations respecting each.

But before entering on the consideration of particular diseases, or what has commonly been styled the practice of medicine, it is necessary to give a general view of the most important functions of the animal body, and of the chief morbid affections to which they are subjected; a branch which has usually been named the *Theory* or *Institutions of Medicine*.

THEORY of MEDICINE, or an Account of the principal Functions of the Animal Body.

WHILE the functions of living animals, but particularly of the human species, are very numerous, the accounts given of these both in a state of health and disease are very various. Without, therefore, pretending to enumerate the contradictory opinions of different authors, we shall here present the reader with a view of this subject, extracted from one of the latest and best publications respecting it, the *Conspectus Medicinæ Theoreticæ* of Dr James Gregory, formerly professor of the institutions of medicine in the university of Edinburgh, and now professor of practice.

In this work, which was first published in 1780, and afterwards reprinted under an enlarged form in 1782, Dr Gregory introduces his subject by observing, that some functions of the human body relate to itself only, and others to external things.

56 Division of the functions into animal, vital, and natural.

To the latter class belong those which by physicians are called the *animal functions*; to which are to be referred all our senses, as well as the power of voluntary motion, by which we become acquainted with the universe, and enjoy this earth. Among the functions which relate to the body, only some have been named *vital*, such as the circulation of the blood and respiration; because, without the constant continuance of these life cannot subsist. Others, intended for repairing the waste of the system, have been termed the *natural functions*

Diviſion of functions. *tions:* for by the conſtant attrition of the ſolids, and the evaporation of the fluid parts of the body, we ſtand in need of nouriſhment to ſupply this waſte; after which the putrid and excrementitious parts muſt be thrown out by the proper paſſages. The digeſtion of the food, ſecretion of the humours, and excretion of the putrid parts of the food, are referred to this claſs; which, though neceſſary to life, may yet be interrupted for a conſiderable time without danger.

57 Diſtinction of diſeaſes into ſimple and compound. A *diſeaſe* takes place, when the body has ſo far declined from a ſound ſtate, that its functions are either quite impeded, or performed with difficulty. A diſeaſe therefore may happen to any part of the body either ſolid or fluid, or to any one of the functions: and thoſe may occur either ſingle, or ſeveral of them joined together; whence the diſtinction of diſeaſes into *ſimple* and *compound*.

We have examples of the moſt ſimple kinds of diſeaſes, in the rupture or other injury of any of the corporeal organs, by which means they become leſs fit for performing their offices; or, though the organs themſelves ſhould remain ſound, if the ſolids or fluids have degenerated from a healthy ſtate; or if, having loſt their proper qualities, they have acquired others of a different, perhaps of a noxious nature; or laſtly, if the moving powers ſhall become too weak or too ſtrong, or direct their force in a way contrary to what nature requires.

58 Symptoms. The moſt ſimple diſeaſes are either productive of others, or of *ſymptoms*, by which alone they become known to us.—Every thing in which a ſick perſon is obſerved to differ from one in health is called a *ſymptom;* and the moſt remarkable of theſe ſymptoms, and which moſt conſtantly appear, define and conſtitute the diſeaſe.

The cauſes of diſeaſes are various; often obſcure, and ſometimes totally unknown. The moſt full and perfect proximate cauſe is that which, when preſent, produces a diſeaſe, when taken away removes it, and when changed alſo changes it.—There are alſo remote cauſes, which phyſicians have been accuſtomed to divide into the *prediſponent* and *exciting* ones.

59 Prediſponent cauſe. The former are thoſe which only render the body fit for a diſeaſe, or which put it into ſuch a ſtate that it will readily receive one.

60 Exciting cauſe. The exciting cauſe is that which immediately produces the diſeaſe in a body already diſpoſed to receive it.

The prediſponent cauſe is always inherent in the body itſelf, though perhaps it originally came from without; but the exciting cauſe may either come from within or from without.

From the combined action of the prediſponent and exciting cauſes comes the *proximate* cauſe, which neither of the two taken ſingly is able to produce;

61 Proximate cauſe. ſeeing neither every exciting cauſe will produce a diſeaſe in every perſon, nor will every one prediſpoſed to a diſeaſe fall into it without an exciting cauſe.—A body prediſpoſed to diſeaſe therefore has already declined ſomewhat from a ſtate of perfect health, although none of its functions are impeded in ſuch a manner that we can truly ſay the perſon is diſeaſed. Yet ſometimes the prediſponent cauſe, by continuing long, may arrive at ſuch an height, that it alone, without the addition of any exciting cauſe, may produce a real diſeaſe.—Of this we have examples in the debility of the ſimple ſolids, the mobility of the living ſolids, and in plethora.—The exciting cauſe alſo, though it ſhould not be able immediately to bring on a diſeaſe; yet if it continues long, will by degrees deſtroy the ſtrongeſt conſtitution, and render it liable to various diſeaſes; becauſe it either produces a prediſponent cauſe, or is converted into it, ſo that the ſame thing may ſometimes be an exciting cauſe, ſometimes a prediſponent one; of which the inclemencies of the weather, ſloth, luxury, &c. are examples. Origin of Diſeaſes.

62 Hereditary diſeaſes. Diſeaſes, however, ſeem undoubtedly to have their origin from the very conſtitution of the animal machine; and hence many diſeaſes are common to every body when a proper exciting cauſe occurs, though ſome people are much more liable to certain diſeaſes than others. Some are hereditary; for as healthy parents naturally produce healthy children, ſo diſeaſed parents as naturally produce a diſeaſed offspring. Some of theſe diſeaſes appear in the earlieſt infancy; others occur equally at all ages; nor are there wanting ſome which lurk unſuſpected even to the lateſt old age, at laſt breaking out with the utmoſt violence on a proper occaſion. Some diſeaſes are born with us, even though they have no proper foundation in our conſtitution, as when a fœtus receives ſome hurt by an injury done to the mother; while others, neither born with us nor having any foundation in the conſtitution, are ſucked in with the nurſe's milk.

63 Diſeaſes from age and ſex. Many diſeaſes accompany the different ſtages of life; and hence ſome are proper to infancy, youth, and old age. Some alſo are proper to each of the ſexes: eſpecially the weaker ſex, proceeding, no doubt, from the general conſtitution of the body, but particularly from the ſtate of the parts ſubſervient to generation. Hence the diſeaſes peculiar to virgins, to menſtruating women, to women with child, to lying-in women, to nurſes, and to old women.

64 Diſeaſes from climate. The climate itſelf, under which people live, produces ſome diſeaſes; and every climate hath a tendency to produce a particular diſeaſe, either from its exceſs of heat or cold, or from the mutability of the weather. An immenſe number of diſeaſes alſo may be produced by impure air, or ſuch as is loaded with putrid, marſhy, and other noxious vapours. The ſame thing may happen likewiſe from corrupted aliment, whether meat or drink; though even the beſt and moſt nutritious aliment will hurt if taken in too great quantity; not to mention poiſons, which are endowed with ſuch pernicious qualities, that even when taken in a very ſmall quantity they produce the moſt grievous diſeaſes, or perhaps even death itſelf.

65 Diſeaſes from accidents. Laſtly, from innumerable accidents and dangers to which mankind are expoſed, they frequently come off with broken limbs, wounds, and contuſions, ſometimes quite incurable; and theſe misfortunes, though proceeding from an external cauſe at firſt, often terminate in internal diſeaſes.

Hitherto we have mentioned only the dangers which come from without; but thoſe are not leſs, nor fewer in number, which come from within. At every breath, man pours forth a deadly poiſon both to himſelf and others. Neither are the effluvia of the lungs alone hurtful: there flows out from every pore of the body a moſt ſubtile and poiſonous matter, perhaps of a putreſcent

Origin of Difeafes. fcent nature, which being long accumulated, and not allowed to diffufe itfelf through the air, infects the body with moft grievous difeafes; nor does it ftop here, but produces a contagion which fpreads devaftation far and wide among mankind. From too much or too little exercife of our animal-powers alfo no fmall danger enfues. By inactivity either of body or mind, the vigour of both is impaired; nor is the danger much lefs from too great employment. By moderate ufe, all the faculties of the mind, as well as all the parts of the body, are improved and ftrengthened; and here nature has appointed certain limits, fo that exercife can neither be too much neglected, nor too much increafed, with impunity. Hence thofe who ufe violent exercife, as well as thofe who fpend their time in floth and idlenefs, are equally liable to difeafes; but each to difeafes of a different kind: and hence alfo the bad effects of too great or too little employment of the mental powers.

66
Difeafes from paffions of the mind.

Befides the dangers arifing from thofe actions of the body and mind which are in our own power, there are others arifing from thofe which are quite involuntary. Thus, paffions of the mind, either when carried to too great excefs, or when long continued, equally deftroy the health; nay, will even fometimes bring on fudden death. Sleep alfo, which is of the greateft fervice in reftoring the exhaufted ftrength of the body, proves noxious either by its too great or too little quantity. In the moft healthy body, alfo, many things always require to be evacuated. The retention of thefe is hurtful, as well as too profufe an evacution, or the excretion of thofe things either fpontaneoufly or artificially which nature directs to be retained. As the folid parts fometimes become flabby, foft, almoft diffolved, and unfit for their proper offices; fo the fluids are fometimes infpiffated, and formed even into the hardeft folid maffes. Hence impeded actions of the organs, vehement pain, various and grievous difeafes. Laftly, fome animals are to be reckoned among the caufes of difeafes: namely, fuch as fupport their life at the expence of others: and thefe either invade us from without, or take up their refidence within the body, gnawing the bowels while the perfon is yet alive, not only with great danger and diftrefs to the patient, but fometimes even producing death itfelf.

67
Vis medicatrix naturæ.

Man, however, is not left without defence againft fo many and fo great dangers. The human body is poffeffed of a moft wonderful power, by which it preferves itfelf from difeafes, keeps off many, and in a very fhort time cures fome already begun, while others are by the fame means more flowly brought to a happy conclufion. This power, called the *autocrateia*, or *vis medicatrix naturæ*, is well known both to phyficians and philofophers, by whom it is moft juftly celebrated; this alone is fufficient for curing many difeafes, and is of fervice in all. Nay, even the beft medicines operate only by exciting and properly directing this force; for no medicine will act on a dead carcafe. But though phyficians juftly put confidence in this power, and though it generally cures difeafes of a flighter nature, it is not to be thought that thofe of the more grievous kind are to be left to the unaffifted efforts of the *vis medicatrix*. Phyficians therefore have a twofold error to avoid, namely, either defpifing the powers of nature too much, or putting too great confidence in them; becaufe in many difeafes thefe efforts are either too feeble or too violent, infomuch that fometimes they are more to be dreaded than even the difeafe itfelf. So far therefore is it from being the duty of a phyfician always to follow the footfteps of Nature, that it is often neceffary for him to take a directly contrary courfe, and oppofe her efforts with all his might.

68
Chemical analyfis of the animal folids.

After this general view of the functions of the animal body, of the nature and caufes of difeafe, and of the powers by which thefe are to be combated, Dr Gregory proceeds to treat of the folid materials of which the body is formed. He tells us, that the animal folid, when chemically examined, yields earth, oil, falt, water, phlogifton or inflammable air, and a great quantity of mephitic air. Thefe elements are found in various proportions in the different parts of the body; and hence thefe parts are endowed with very different mechanical powers, from the hardeft and moft folid bone to the foft and almoft fluid retina. Nay, it is principally in this difference of proportion between the quantities of the different elements, that the difference between the folid and fluid parts of the animal confift, the former having much more earth and lefs water in their compofition than the latter. The cohefion, he thinks, is owing to fomething like a chemical attraction of the elements for one another; and its caufe is neither to be fought for in the gluten, fixed air, nor earth. This attraction, however, is not fo ftrong but that even during life the body tends to diffolution; and immediately after death putrefaction commences, provided only there be as much moifture in it as will allow an inteftine motion to go on. The greater the heat, the fooner does putrefaction take place, and with the greater rapidity does it proceed; the mephitic air flies off, and together with it certain faline particles; after which, the cohefion of the body being totally deftroyed, the whole falls into a putrid colluvies, of which at length all the volatile parts being diffipated, nothing but the earth is left behind.

This analyfis, he owns, is far from being perfect; becaufe nobody has ever been able, by combining the chemical principles of flefh, to reproduce a compound any thing like what the flefh originally was: but, however imperfect the analyfis may be, it ftill has the advantage of fhowing in fome meafure the nature and caufes of certain difeafes, and thus leads phyficians to the knowledge of proper remedies.

69
Qualities of the animal folids.

The folid parts are fitted for the purpofes of life in three feveral ways; namely, by their cohefion, their flexibility, and their elafticity, all of which are various in the various parts of the body. Moft of the functions of life confift in various motions. In fome the moft violent and powerful motions are required; and therefore fuch a degree of cohefion is neceffary in thefe parts as will be fufficient for allowing them to perform their offices without any danger of laceration. It is therefore neceffary that fome of the folid parts fhould be more flexible than others; and it is likewife neceffary that thefe parts, along with their flexibility, fhould have a power of recovering their former fhape and fituation, after the removal of the force by which they were altered.

Thefe variations in flexibility, within certain limits

Qualities of the Animal Solids. mits, ſeldom produce any material conſequence with regard to the health: though ſometimes, by exceeding the proper bounds, they may bring on real and very dangerous diſeaſes; and this either by an exceſs or diminution of their coheſion, flexibility, or elaſticity. By augmenting the coheſion, the elaſticity is alſo for the moſt part augmented, but the flexibility diminiſhed; by diminiſhing the coheſion, the flexibility becomes greater, but the elaſticity is diminiſhed.

The cauſes of theſe affections, though various, may be reduced to the following heads. Either the chemical compoſition of the matter itſelf is changed; or, the compoſition remaining the ſame, the particles of the ſolid may be ſo diſpoſed, that they ſhall more or leſs ſtrongly attract one another. As to the compoſition, almoſt all the elements may exiſt in the body in an undue proportion, and thus each contribute its ſhare to the general diſorder. But of many of theſe things we know very little; only it is apparent, that the fluid parts, which conſiſt chiefly of water, and the ſolid, which are made up of various elements, are often in very different proportions: the more water, the leſs is the coheſion or elaſticity, but the greater the flexibility; and the reverſe happens, if the ſolid or earthy part predominates.

70
Cauſes affecting the ſolids.

The remote cauſes of theſe different ſtates, whether prediſponent or exciting, are very various. In the firſt place, idioſyncraſy itſelf, or the innate conſtitution of the body, contributes very much to produce the abovementioned effects. Some have naturally a much harder and drier temperament of the body than others; men, for inſtance, more than women; which can with the utmoſt difficulty, indeed ſcarce by any means whatever, admit of an alteration. The ſame thing takes place at different periods of life; for, from firſt to laſt, the human body becomes always drier and more rigid. Much alſo depends on the diet made uſe of, which always produces a correſponding ſtate of the ſolids in proportion to its being more or leſs watery. Neither are there wanting ſtrong reaſons for believing, that not only the habit of the body, but even the diſpoſition of the mind, depends very much on the diet we make uſe of. The good or bad concoction of the aliment alſo, the application of the nouriſhment prepared from it, and likewiſe the ſtate of the air with regard to moiſture or dryneſs, affect the temperament of the body not a little; and hence thoſe who inhabit mountains or dry countries, are very different from the inhabitants of low marſhy places. Laſtly, the manner of living contributes ſomewhat to this effect: Exerciſe preſſes out and exhales the moiſture of the body, if in too great quantity; on the contrary, ſloth and lazineſs produce an effect directly oppoſite, and cauſe a redundancy of humour.

But, putting the chemical compoſition of the ſolid parts out of the queſtion altogether, they may be affected by many other cauſes. The condenſation, for inſtance, or compreſſion of the particles, whether by mechanical cauſes or by means of cold or heat, makes a conſiderable alteration in the ſtrength and elaſticity of every ſolid body. How much mechanical preſſure contributes to this may be underſtood from the experiments of Sir Cliſton Wintringham: and hence alſo are we to deduce the reaſon of many facts of the higheſt importance in the animal economy; namely, the growth, ſtate, decreaſe of the body; its rigidity daily increaſing; and at laſt the unavoidable death incident to old age from a continuance of the ſame cauſes.

Perhaps the different denſity of the ſolids is in ſome meaſure owing to Nature herſelf; but it ſeems rather to depend more on the powers of exerciſe or inactivity in changing the ſtate of the ſolids, the effects of which on the body, whether good or bad, may hence be eaſily underſtood.

Heat relaxes and expands all bodies, but cold renders them more denſe and hard; the effects of which on the human body are well known to moſt people. Though the body is found to preſerve a certain degree of heat almoſt in every ſituation, it is impoſſible but that its ſurface muſt be affected by the temperature of the ambient atmoſphere; and we have not the leaſt reaſon to doubt that every part of the body may thus feel the effects of that temperature. What a difference is there between one who, expoſed to the ſouth-wind, becomes lazy and languid, ſcarce able to drag along his limbs; and one who feels the force of the cold north-wind, which renders the whole body alert, ſtrong, and fit for action?

That theſe various cauſes, each of which is capable of affecting the conſtitution of the body when taken ſingly, will produce much greater effects when combined, is ſufficiently evident. The experiments of Bryan Robinſon, the effects of the warm bath, and indeed daily experience, ſhow it fully.

It is not yet certainly known what is the ultimate ſtructure of the minuteſt parts of the animal-ſolid; whether it conſiſts of ſtraight fibres or threads, whoſe length is very conſiderable in proportion to their breadth, variouſly interwoven with one another, as Boerhaave ſuppoſes; or of ſpiral ones, admirably convoluted and interwoven with one another, as ſome microſcopical experiments ſeem to ſhow; or whether the cellular texture be formed of fibres and *laminæ*, and from thence the greateſt part of the body, as the celebrated Haller hath endeavoured to prove.

71
Cellular texture.

The cellular texture is obſerved throughout the whole body: it ſurrounds and connects the fibres themſelves, which are ſufficiently apparent in many of the organs; and ſlightly joins the different parts which ought to have any kind of motion upon the neighbouring ones. By a condenſation of the ſame ſubſtance alſo, the ſtrongeſt, and what ſeem the thinneſt, membranes are formed; the moſt ſimple of which, being accurately examined, diſcover the cellular ſtructure. This cellular ſubſtance ſometimes increaſes to a ſurpriſing degree, and all parts formed of it, membranes, veſſels, &c. eſpecially by a gentle diſtenſion; for a ſudden and violent diſtenſion either breaks it altogether, or renders it thinner. Sometimes alſo it grows between neighbouring parts, and joins thoſe which nature has left free. Preternatural concretions of this kind are often obſerved after an inflammation of the lungs or of the abdominal viſcera; and theſe new membranes are found to be truly cellular. This ſubſtance, when cut, or by any other means divided, grows together of its own accord; but if, by reaſon of very great inflammation and ſuppuration, a large portion of the cellular texture has been deſtroyed, it is never again renewed, and an ugly ſcar is left. It is even ſaid, Cellular Texture. faid, that this fubftance, in certain cafes, is capable of joining the parts either of the fame body with one another, or of a foreign body with them; and upon this, if on any foundation, refts the art of Taliacotius and that of tranfplanting teeth, lately fo much talked of.

The cellular texture is in fome places merely a kind of net-work, in others filled with fat. Wherever too great bulk or compreffion would have been inconvenient or dangerous, as in the head, lungs, eyes, eyebrows, penis, fcrotum, &c. there it collects no fat, but is lax, and purely reticulated; but between the mufcles of the body and limbs below the fkin, in the abdomen, efpecially in the omentum and about the kidneys, very much fat is fecreted and collected.

72 Animal fat. The fat is a pure animal oil, not very different from the expreffed and mild vegetable ones; during life it is fluid, but of different degrees of thicknefs in different parts of the body. It is fecreted from the blood, and is often fuddenly reabforbed into it, though pure oil is very rarely obferved in the blood. It is indeed very probable, that oil, by digeftion, partly in the primæ viæ, and partly in the lungs, is converted into gluten, and this again into oil by means of fecretion; though no organs fecreting the fat can be fhown by anatomifts. It is, however, probable, that there are fuch organs; and that the cellular texture has fome peculiar ftructure in thofe parts which are deftined to contain the fat already fecreted, without fuffering it to pafs into other places; for it never paffes into thofe parts which are purely reticulated, although the cellular texture is eafily permeable by air or water over the whole body from head to foot.

The fat is augmented by the ufe of much animal-food, or of any other that is oily and nourifhing, provided the digeftion be good; by the ufe of ftrong drink, efpecially malt-liquor; by much reft of body and mind, much fleep and inactivity, caftration, cold, repeated bloodletting, and in general by whatever diminifhes the vital and animal powers. Much, however, depends on the conftitution of the body itfelf; nor is it poffible to fatten a human creature at pleafure like an ox. A certain degree of fatnefs, according to the age of the perfon, is a fign and effect of good health; but when too great, it becomes a difeafe of itfelf, and the caufe of other difeafes. It may always be very certainly removed by ftrong exercife, little fleep, and a fpare and folid diet. The fat always makes up a confiderable part of the bulk of the body, and very often by far the greateft part. Its ufe feems to be to make the motion of the body more eafy and free by leffening the friction of the moving parts, and thus preventing the abrafion of the folids, which would otherwife happen. It is alfo of ufe to hinder the parts from growing together, which fometimes happens, when by an ulcer or any other accident a part of the cellular texture containing the fat is deftroyed. Befides all this, the fat contributes not a little to the beauty of the body, by filling up the large interftices between the mufcles, which would otherwife give the perfon a deformed and fhocking appearance. It is thought to be nutritious, when abforbed from its cells by the blood; but of this we have no great certainty. It feems to have fome power of defending from the cold, feeing nature has beftowed it in very great quantity on thofe animals which inhabit the colder regions. Animal Fat.

73 Vital folids. Thofe parts of the body which enjoy fenfe and mobility, are called *living* or *vital* folids. They are the brain, cerebellum, medulla oblongata, fpinal marrow, the nerves arising from thefe and diffufed throughout the whole body, and which are diftributed through the various organs of fenfe and through the mufcles, and laftly the mufcles themfelves. Senfation is much more general than mobility, as being common to all the parts already mentioned. Mobility is proper to the mufcular fibres alone: wherever there is fenfation, therefore, we may believe that there are nerves; and wherever there is mobility, we may believe that mufcular fibres exift. Nay, even mobility itfelf feems to originate from the connection which the mufcles have with the nerves; for foon after the nerves are compreffed, or tied, or cut, the mufcles to which they are diftributed lofe their faculties; which happens, too, when the brain itfelf, or the origin of the nerves, is affected. Some reckon that the mufcles are produced from the nerves, and confift of the fame kind of matter. Both indeed have a fimilar ftructure, as being fibrous and of a white colour: for the mufcles when well freed from the blood, of which they contain a great abundance, are of this colour as well as the nerves; neither can the nervous fibres by any means be diftinguifhed from the mufcular fibres themfelves. Both have alfo fenfation; and both ftimulants and fedatives act in the fame manner, whether they be applied to the mufcles themfelves or to the nerves.

It is difficult for us to difcover the origin of many parts of the body, or to afcertain whether they are produced all at the fame time or one after another: yet it muft be owned, that many of the mufcular parts are obferved to have attained a remarkable degree of ftrength, while the brain is ftill foft and almoft fluid; and that the action of thefe mufcular parts is required for the action and growth of the brain. The mufcles are alfo of a much firmer contexture than the nerves; and enjoy a power of their own, namely, that of irritability, of which the nerves never participate. Of neceffity, therefore, either the mufcles muft be conftructed of fome kind of matter different from that of the nerves; or if both are made of the fame materials, their organization muft be exceedingly different. But if the fubftance of the mufcles and nerves be totally different, we may eafily be convinced that much of the one is always mixed with the other; for it is impoffible to prick a mufcle even with the fmalleft needle, without wounding or lacerating many nervous fibres at the fame time. Since, therefore, there is fuch a clofe connection between the mufcles and nerves both as to their functions and ftructure, they are defervedly reckoned by phyfiologifts to be parts of the fame genus, called the *genus nervofum*, or *nervous fyftem*.

After treating of fenfe in general, Dr Gregory proceeds to confider particularly each of the fenfes both external and internal. He begins with the fenfe of feeling, as being the moft fimple, and at the fame time in common to every part of the nervous fyftem. In fome places, however, it is much more acute than in others; in the fkin, for inftance, 74 Senfe of feeling.

External Senses. ſtance, and eſpecially in the points of the fingers. Theſe are reckoned to have *nervous papillæ*, which by the influx of the blood are ſomewhat erected in the action of contact, in order to give a more acute ſenſation; though indeed this opinion ſeems rather to be founded on a conjecture derived from the ſtructure of the tongue, which is not only the organ of taſte, but alſo a moſt delicate organ of touch, than upon any certain obſervations.

75 Pain. From the ſenſe of feeling, as well as all the other ſenſes, either pain or pleaſure may ariſe; nay, to this ſenſe we commonly refer both pain and almoſt all other troubleſome ſenſations, tho' in truth pain may ariſe from every vehement ſenſation. It is brought on by any great force applied to the ſentient part; whether this force comes from within or from without. Whatever, therefore, pricks, cuts, lacerates, diſtends, compreſſes, bruiſes, ſtrikes, gnaws, burns, or in any manner of way ſtimulates, may create pain. Hence it is ſo frequently conjoined with ſo many diſeaſes, and is often more intolerable even than the diſeaſe itſelf. A moderate degree of pain ſtimulates the affected part, and by degrees the whole body; produces a greater flux of blood and nervous power to the part affected; and often ſtimulates to ſuch motions as are both neceſſary and healthful. Hence, pain is ſometimes to be reckoned among thoſe things which guard our life. When very violent, however, it produces too great irritation, inflammation and its conſequences, fever, and all thoſe evils which flow from too great force of the circulation; it diſorders the whole nervous ſyſtem, and produces ſpaſms, watching, convulſions, delirium, debility, and fainting. Neither the mind nor body can long bear very vehement pain; and indeed Nature has appointed certain limits, beyond which ſhe will not permit pain to be carried, without bringing on delirium, convulſions, ſyncope, or even death, to reſcue the miſerable ſufferer from his torments.

Long continued pain, even though in a more gentle degree, often brings on debility, torpor, palſy, and rigidity of the affected part. But if not too violent, nor accompanied with fever, ſickneſs, or anxiety, it ſometimes ſeems to contribute to the clearneſs and acuteneſs of the judgment, as ſome people teſtify who have been afflicted with the gout.

76 Anxiety. Anxiety is another diſagreeable ſenſation, quite different from pain, as being more obtuſe and leſs capable of being referred to any particular part, though frequently more intolerable than any pain. But we muſt take care to diſtinguiſh between this anxiety of which we treat in a medical ſenſe, and that which is ſpoken of in common diſcourſe. The latter does not at all depend on the ſtate of the body, but belongs entirely to the mind; and ariſes from a ſenſe of danger, or a foreſight of any misfortune. The former is truly corporeal; and derives, no leſs than pain, its origin from a certain ſtate of the body. Notwithſtanding this difference, however, it is very poſſible for both theſe kinds of anxiety to be preſent at the ſame time, or for the one to be the cauſe of the other. A very great bodily anxiety will ſtrike fear and deſpondency into the moſt reſolute mind; and mental anxiety, on the contrary, if very violent and long-continued, may induce the former, by deſtroying the powers of the body, eſpecially thoſe which promote the circulation of the blood.

Anxiety, in the medical ſenſe of the word, ariſes in the firſt place from every cauſe diſturbing or impeding the motion of the blood through the heart and large veſſels near it. Anxiety, therefore, may ariſe from many diſeaſes of the heart and its veſſels, ſuch as its enlargement, too great conſtriction, oſſification, polypus, palpitation, ſyncope, inflammation, debility, and alſo ſome affections of the mind. It is likewiſe produced by every difficulty of breathing, from whatever cauſe it may ariſe; becauſe then the blood paſſes leſs freely through the lungs: anxiety of this kind is felt deep in the breaſt. It is ſaid alſo to ariſe from the difficult paſſage of the blood through the liver or other abdominal viſcera.

A certain kind of anxiety is very common and troubleſome to hypochondriacal people; and ariſes from the ſtomach and inteſtines being either loaded with indigeſted and corrupted food, or diſtended with air produced by fermentation and extricated from the aliments. By ſuch a load, or diſtenſion, the ſtomach, which is a very delicate organ, becomes greatly affected. Beſides, the free deſcent of the diaphragm is thus hindered, and reſpiration obſtructed. Anxiety of this kind is uſually very much and ſuddenly relieved by the expulſion of the air; by which, as well as by other ſigns of a bad digeſtion, it is eaſily known. In theſe caſes the anxiety is uſually, though with little accuracy, referred to the ſtomach.

Anxiety alſo frequently accompanies fevers of every kind, ſometimes in a greater and ſometimes in a leſſer degree. In this caſe it ariſes as well from the general debility as from the blood being driven from the ſurface of the body and accumulated in the large veſſels; as in the beginning of an intermittent fever. Or it may ariſe from an affection of the ſtomach, when overloaded with crude, corrupted aliment; or diſtended and nauſeated with too much drink, eſpecially medicated drink. As the fever increaſes, the anxiety of the patient becomes greater and greater; remarkably ſo, according to the teſtimony of phyſicians, either immediately before the criſis or on the night preceding it; as before the breaking out of exanthemata, hæmorrhagy, ſweat, or diarrhœa, which ſometimes remove fevers. The patient feels likewiſe an anxiety from the ſtriking in of any eruption or critical metaſtaſis. This ſenſation alſo accompanies fevers and moſt other diſeaſes, when the vital power is exhauſted, and death approaches, of which it is the forerunner and the ſign. It happens at that time, becauſe the vital powers, unable to perform their functions, cannot make the blood circulate. But what kind of anxiety this is, the other ſigns of approaching death ſhows very evidently. Moreover, even in the time of ſleep, anxiety may ariſe from the ſame cauſes: hence frightful dreams, which frequently diſturb our repoſe with ſurpriſe and terror.

Itching, an uneaſy ſenſation, with a deſire of ſcratching the place affected, is often very troubleſome, altho' it ſeems to be more a-kin to pleaſure than to pain. 77 Itching.
As pain proceeds from too great an irritation, either chemical or mechanical, ſo does itching proceed from a ſlight one. Titillation, or friction, of a woollen ſhirt, for

External Senses. for instance, upon the skin of a person unaccustomed to it, and of a delicate constitution, excites itching; as do also many acrid fossils, vegetables, and animals. Hence an itching is the first sensation after the application of cantharides, although the same, when augmented, becomes painful. The same effect is produced by any thing acrid thrown out upon the skin; as in exanthematic fevers, the disease called the *itch*, &c. Lice, worms, especially ascarides, irritating either the skin or the intestines, excite a troublesome itching. Certain species of internal itching excites people to many necessary actions both in a diseased and healthy state; such as the excretion of the fæces and urine, coughing, sneezing, and the like.

Too acute a sensation over the whole body is very rarely if ever observed. In a particular part the sense of feeling is often more acute than it ought to be, either from the cuticle itself being too thin and soft, or being removed; or from the part itself being inflamed, or exposed to too great heat. It becomes obtuse, or is even quite destroyed over the whole body, or in great part of it, from various affections of the brain and nerves; as when they are wounded, compressed, or defective in vital power. This is called *anæsthesia*, and sometimes accompanies palsy.

This sense may be deficient in a particular part, either from the nerve being diseased, or from its being compressed or wounded, or from the part itself being exposed to too great a degree of cold;—or from the scarf-skin which covers it being vitiated, either becoming too thick or hard, by the handling of too rough, or hard, or hot bodies, as is the case with glass-makers and smiths; or from the elevation of the cuticle from the subjacent cutis, or true skin itself, by the interposition of blood, serum, or pus; or from the cutis being macerated, relaxed, or become torpid, which sometimes happens to hydropic persons; or lastly, from the whole organ being corrupted by gangrene, burning, cold, or contusion. This sense is very rarely depraved, unless perhaps in the case of delirium, when all the functions of the brain are disturbed in a surprising manner.

78 Taste. The sense next to be considered is that of taste, the principal organ of which is the tongue; the nearer the tip of it, the more acute is the sense, and the nearer the glottis so much the more obtuse. It must be owned, however, that some kind of acrid substances, the taste of which is scarce perceived upon the tip of the tongue, excite a most vehement sensation about its roots, or even in the throat itself. The tongue is endowed with many large and beautiful nervous papillæ, which seem to be the chief seat of this sense, and in the act of tasting are elevated and erected, in order to give the more acute sensation.

Nothing can be tasted which is not soluble in the saliva, that, being applied in a fluid form, it may pervade the involucra of the tongue, and affect its nervous pulp; and hence insoluble earths are quite insipid. Neither is it sufficient for a body to be soluble that it may be tasted: it must also have something in it saline, or at least acrid, in order to stimulate the nervous substance; and hence, whatever has less salt than the saliva is totally insipid.

The taste is rarely found to be too acute, unless through a fault in the epidermis which covers the tongue. If this be removed or wounded, or covered with ulcers, aphthæ, &c. then the taste, becoming too acute, is painful: or sometimes no other sensation than that of pain is felt. It may be impaired, as well as the sense of feeling, from various diseases of the brain and nerves; of which, however, the instances are but rare. In some people it is much more dull than in others; and in such the sense of smelling is usually deficient also. The taste is most commonly deficient on account of the want of saliva; for a dry tongue cannot perceive any taste: hence this sense is very dull in many diseases, especially in fevers, catarrhs, &c. as well on account of the defect of saliva as of appetite, which is of so much service in a state of health; or by reason of the tongue being covered with a viscid mucus.

The taste is frequently depraved; when, for example, we have a perception of taste without the application of any thing to the tongue; or, if any thing be applied to it, when we perceive a taste different from what it ought to be. This happens for the most part from a vitiated condition of the saliva, which is itself tasted in the mouth. Hence we may perceive a sweet, saline, bitter, putrid, or rancid taste, according to the state of the saliva: which may be corrupted either from the general vitiated condition of the mass of humours, or the glands which secrete it; of the mouth itself; or even of the stomach, the vapours and eructations of which rise into the mouth, especially when the stomach is diseased.

Besides the faults of the saliva, however, the taste may be vitiated from other causes; as, for instance, the condition of the nervous papillæ. This, however, is as yet but little known to us; for the taste is sometimes plainly vitiated when at the same time the saliva appears quite insipid when tasted by other people.

Physicians, in almost every disease, but especially in fevers, inquire into the state of the tongue; not, indeed, without the greatest reason: for from this they can judge of the condition of the stomach; of the thirst, or rather the occasion the patient has for drink, when, on account of his delirium or stupor, he neither feels his thirst nor is able to call for drink. And, lastly, from an inspection of the tongue, physicians endeavour to form some judgment concerning the nature, increase, and remission of the fever.

After the sense of taste, Dr Gregory next treats of that of smell. Its seat is in that very soft and delicate membrane, filled with nerves and blood-vessels, which covers the internal parts of the nose, and the various sinuses and cavities proceeding from thence. This sense is more acute about the middle of the septum, and the *ossa spongiosa*, where the membrane is thicker and softer, than in the deeper cavities, where the membrane is thinner, less nervous, and less filled with blood-vessels; although even these do not seem to be altogether destitute of the sense of smelling. 79 Smell.

As by our taste we judge of the soluble parts of bodies, so by our smell we judge of those very volatile and subtile parts which fly off into the air; and like the organ of taste, that of smell is kept moist, that it may have the more exquisite sensation, partly by its proper mucus, and partly by the tears which descend from the eyes.

Some kinds of odours greatly affect the nervous system, External Senses.

ſtem, and produce the moſt ſurpriſing effects. Some gratefully excite it, and immediately recruit the ſpirits when almoſt ſinking; while ſome produce fainting, nay, as it is alleged, even ſudden death. To this head alſo are we to refer thoſe antipathies, which, though truly ridiculous, are often not to be ſubdued by any force of mind.

This ſenſe is ſometimes too acute, as well from ſome diſeaſe in the organ itſelf, which happens more rarely, as from the too great ſenſibility of the nervous ſyſtem in general, as is ſometimes obſerved in nervous fevers, phrenitis, and hyſteria. It is more frequently, however, too dull, either from diſeaſes of the brain and nerves, as from ſome violence done to the head, or from ſome internal cauſe; or it may proceed from a dryneſs of the organ itſelf, either on account of the cuſtomary humours being ſuppreſſed or turned another way, or from the membranes being oppreſſed with too great a quantity of mucus or of tears. Of both theſe caſes we have inſtances in the catarrh, where at firſt the noſtrils are dry, but afterwards are deluged with a thin humour, or ſtopped up with a thick one. But in theſe, and many other examples, the membrane of the noſe itſelf is affected with inflammation, relaxation, or too great tenſion, by which it is impoſſible but the nerves, which conſtitute a great part of it, muſt be vitiated. It is evident alſo, that whatever obſtructs the free entrance of the air into the noſtrils, or impedes its paſſage through them, muſt prove detrimental to the ſenſe of ſmelling.

80 Hearing.

The ſenſe of hearing is more frequently vitiated than almoſt any of the reſt, as having a moſt delicate organ, and one compoſed of many and very ſmall parts, of which an account is given under the article Anatomy.—It frequently becomes too acute; either from the general habit of the body being too irritable, ſuch as often happens to hyſterical and lying-in-women: or from too great a ſenſibility of the brain itſelf, which is not unfrequently obſerved in fevers, as well as in phrenitis, and ſometimes in the true mania; or it may be from a diſeaſe of the ear itſelf, as when it is affected with inflammation, pain, or too great tenſion.—It may be rendered dull, or even be altogether deſtroyed, ſo that the perſon ſhall become totally deaf from the ſame cauſes acting with different degrees of force. This happens eſpecially from the want of the external ear; or from the meatus auditorius being ſtopped up with mucus, wax, or other matters; or from the ſides of the canal growing together, as ſometimes happens after ſuppuration or the ſmall-pox; or by the membrane of the tympanum becoming rigid or relaxed, or being eroded or ruptured; or the tympanum itſelf, or the Euſtachian tube, may from certain cauſes be obſtructed; or ſome of the little bones or membranes, or ſome of the muſcles of the labyrinth itſelf, may be affected with concretion, ſpaſm, palſy, or torpor; or laſtly, it may happen from diſeaſes of the brain and nerves, all the organs of hearing remaining ſound. Hence deafneſs is often a nervous diſeaſe, coming ſuddenly on, and going off of its own accord. Hence alſo it is common in old people, all of whoſe ſolid parts are too rigid, while their nervous parts have too little ſenſibility.

Perſons labouring under fevers, eſpecially of the typhous kind, often become deaf. When this comes on along with other ſigns of an oppreſſed brain, and a great proſtration of ſtrength, it may be a very bad ſign; but for the moſt part it is a very good one, even though accompanied with ſome degree of torpor or ſleepineſs.

A very common diſeaſe in the ſenſe of hearing is when certain ſounds, like thoſe of a drum, a bell, the falling of water, &c. are heard without any tremor in the air, or without a ſound perſon's hearing any thing. This diſeaſe is called *tinnitus aurium*, of which various kinds have been obſerved. For the moſt part it is a very ſlight tranſient diſorder; but ſometimes it is moſt obſtinate, long-continued, and troubleſome. It ſometimes ariſes from the ſlighteſt cauſe, ſuch as any thing partially ſtopping up the meatus auditorius or Euſtachian tube itſelf, ſo that acceſs is in part denied to the air; whence it happens that the latter ſtrikes the membrane of the tympanum, or perhaps the interior parts, unequally, and with too much force. Hence *bombi*, a kind of tinnitus, are heard even by the moſt healthy when they yawn.

A much more frequent and troubleſome ſpecies of tinnitus accompanies many diſeaſes both of the febrile and nervous kind. This is occaſioned partly by the increaſed impetus of the blood towards the head, with an increaſe of ſenſibility in the nervous ſyſtem itſelf, ſo that the very beatings of the arteries are heard; and partly from the increaſed ſenſation and mobility of the nerves and muſcles of the labyrinth: whence it happens, that the parts which ought to be at reſt until excited by the tremor of the air, begin to move of their own accord, and impart their motion to other parts which are already in a morbid ſtate of too great ſenſibility.

A tinnitus ſometimes ariſes from any vehement affection of the mind; ſometimes from a diſorder in the ſtomach; ſometimes from a rheumatic diſorder affecting the ears and head; or from a catarrh, which commonly affects the tube. Sometimes, however, the tinnitus alone affects the patient; and even this is a diſeaſe of no ſmall conſequence. Theſe various cauſes, however, both of this and other diſorders of the hearing, are often very difficult to be diſtinguiſhed, as well on account of the inacceſſible ſituation of the organ, as on account of the little knowledge we have of its action. But from whatever cauſe it ariſes, both this and the other various affections of the hearing can neither be cured certainly nor eaſily.

81 Sight.

Concerning the nature of the ſenſe of ſight, the reader may conſult the articles Anatomy and Optics. Of this ſenſe ſome ſlight diſorders, or rather varieties, are often obſerved. Thoſe perſons are called *ſhort-ſighted* who cannot ſee diſtinctly unleſs the object be very near them. This diſorder ariſes from too great a refraction of the rays by reaſon of their being too ſoon collected into a focus by the cryſtalline lens, and diverging again before they fall upon the retina, by which means they make an indiſtinct picture upon it. The moſt uſual cauſe is too great a convexity of the eye or ſome of its humours, as too prominent a cornea. It is a diſorder common to young people, which is ſometimes removed when they grow older. As ſoon as the firſt approaches of ſhort-ſightedneſs are obſerved, it is ſuppoſed it may be obviated by the perſon's

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accustoming himself to view remote objects, and keeping his eyes off very small and near ones; as, on the contrary, it may be brought on by the opposite custom; because the eye accommodates itself somewhat to the distances of those objects which it is accustomed to view. But a concave glass, which causes the rays of light to diverge more than naturally they would before falling upon the cornea, is the most simple and certain remedy.

Long-sighted people are those who cannot see an object distinctly unless it be at a considerable distance from them. This arises from causes contrary to the former; namely, the eye being too flat, so that there is no room for refracting the rays and bringing them into a focus. Hence this defect is common in old people, and remedied by the use of convex glasses.

Those are called *nyctalopes* who see better with a very weak than with a strong light. It is a defect very seldom to be met with in the human race, though every person is sensible of it who hath been long kept in the dark and is then suddenly brought into the light. The disease arises from too great a sensibility of the retina, and the pupil being too open.

The sight is liable to many and grievous disorders. It is sharpened beyond measure, so that the person either perceives nothing distinctly, or with great pain, from the same causes that induce a similar disorder in the other senses; namely, excessive sensibility in the general habit of body; or a particular state of the brain common in phrenitis, or even in those afflicted with fevers arising from inflammation or too great excitement; though more frequently from the condition of the eye itself, one becomes unable to bear the light. The inflammation of the tunica adnata, and the forepart of the sclerotica, is communicated to the back parts of it, and from thence to the choroides and retina itself. Hence the light becomes intolerable, and vision is attended with pain and great irritation, sometimes inducing or augmenting a delirium.

The sense of seeing is made dull, or even totally abolished, by age; the aqueous humour not being supplied in sufficient quantity, and the cornea and lens, or the vitreous humour, becoming shrivelled or decayed. It may likewise happen from the cornea becoming dry and opaque; which is to be imputed to the languid motion of the blood, and to great numbers of the small vessels being obstructed or having their sides concreted;—or from the crystalline lens becoming yellow like amber, and the retina itself less sensible, for old age diminishes every sensation. It is totally abolished by injuries of the brain, the optic nerve, or the retina, even though the structure of the organ should remain sound. This disease is called an *amaurosis*; and is easily known by the dilatation and immobility of the pupil, the humours of the eye remaining clear. It is commonly owing to congestion of blood; and sometimes, where no congestion of blood can be shown, to mere torpor of the nerves. If it be only a torpor of part of the retina, we see black spots in those things at which we look; or flies seem to pass before our eyes, a very bad sign in fevers, and almost always mortal. The sight is abolished also by the obscurity or opacity of any of the parts through which the rays ought to pass and be refracted; as if the cornea lose its transparency by being covered with spots; or the aqueous humours become corrupted with blood, serum, or pus; or the lens (which often happens and which is called a *cataract*) becomes of a grey or brown colour, or the vitreous humour be in like manner corrupted; or lastly, when all the humours being dissolved, confused, and mixed together, by inflammation and suppuration, either do not suffer the light to pass at all, or to pass imperfectly and unequally; whence either no image is formed on the retina, or it appears obscure, distorted, imperfect, and ill-coloured.

The sight is also depraved, when things appear to it of a colour different from their own, or even in another situation and of another shape than they ought to have. This happens from the humours being tinctured with any unusual colour, as is said to happen in some instances of jaundice; or from an extravasation and mixture of the blood with the aqueous humour. A surprising depravation also, or constant and perpetual defect of vision, is not unfrequently observed in men otherwise very healthy, and who see quite clearly; namely, that they cannot distinguish certain colours, green, for example, from red*. Another depravation is, when, without any light being admitted to the eyes, sparks, small drops of a flame or gold colour, and various other colours, are observed to float before us. This is generally a very slight and transient disorder, common to those whose constitutions are very irritable; and arises from the slight impulse, as it would seem, on the retina, by the vessels beating more vehemently than usual. A fiery circle is observed by pressing the eye with the finger after the eye-lids are shut. The same reason, perhaps, may be given for those sparks which are seen by persons labouring under the falling-sickness, and increasing to the size of an immense and luminous beam before they fall down in convulsions. A similar beam those who have recovered from hanging or drowning testify that they have observed: for by reason of the respiration being suppressed, the vessels of the head swell and compress the whole brain and nervous parts of the head. Sparks of the same kind, and these too of no good omen, are observed in patients labouring under a fever, where a phrenitis or fierce delirum is at hand: and likewise in those who are threatened with palsy, apoplexy, or epilepsy.—A distinct but false perception, namely of visible things which do not exist, is to be imputed to some injury of the brain, to madness or a delirium, not to any disease of the eye.

* See the article COLOURS (*incapacity of distinguishing*).

A very frequent defect of vision remains to be mentioned; namely, squinting. A person is said to squint who has the axes of the eyes more oblique than usual, and directed to different points. Hence a great deformity, and often an imperfect and confused vision by which the objects are sometimes seen double. It is an evil for the most part born with the person, and often corrected by those attempts which an infant makes to see more pleasantly and distinctly; and this even without being conscious of its own defects. It is also easily learned, especially in infants, even without their own knowledge, by that kind of imitation which has a great influence over the human race, especially in their tender years.—It is by no means, however, so easily unlearned.

Squinting is frequently occasioned by a spasm, palsy, rigi-

External Senses. rigidity, &c. of the muscles which manage the eye; by epilepsy; by certain diseases of the head, the hydrocephalus especially; or by any great injury done to the head. Sometimes, though very rarely, it comes on suddenly without any known cause. It is very probable, however, that squinting often arises from a fault of the retinæ, when their central points, for instance, and those similarly placed with respect to the centre, do not agree. In this case there must be a contortion of the eye, that the object may not be seen double. This seems also to be the reason why squinting is horribly increased when the person brings the object near his eye in order to view it more perfectly. Or if the central point of either, or both, of the retinæ be insensible, or nearly so, it is necessary for the person to distort his eyes that he may have any distinct vision of objects. If the optic nerve had not entered the retina obliquely, but passed directly through its centre, we would all either have squinted or seen double.

82 Vertigo. Physicians have referred to the sense of vision that most troublesome sensation which we call a *vertigo:* though it seems rather to belong to that of feeling, or of consciousness; for in many instances the disorder is not removed either in the dark or by shutting the eyelids. The vertigo takes place when external objects really at rest seem to reel, to whirl round, to tremble, or to move in any manner of way. If the disorder be very violent, the person is neither able to see, on account of a dimness of sight; nor can he stand, as the powers fail which ought to govern the limbs. A nausea also usually accompanies the vertigo, and the one generally produces the other.

This disorder is observed to be both the symptom and forerunner of some dangerous diseases; such as apoplexy, epilepsy, hysteria; hæmorrhages from the nose and other parts; suppressions of the menses; plethora; fevers, as well such as are accompanied with debility as those in which there is an increased impetus of the blood towards the head. An injury done to the head also, but rarely one done to the eyes unless in so far as it affects the whole head, brings on a vertigo. A vertigo may be likewise produced by a very great and sudden loss of blood or other fluid; by debility; syncope; various diseases of the alimentary canal, of the stomach especially; poisons admitted into the body, particularly of the narcotic kind, as opium, wine, &c. and hence vertigo is a sympton of every kind of drunkenness. Various motions also, either of the head or the whole body, being tossed in a ship, especially if the vessel be small and the sea runs high, produce a vertigo. In these and similar examples, the unusual and inordinate motions of the blood are communicated to the nervous parts which are in the head; or these being affected by sympathy from the neighbouring parts, produce a confused sensation as if of a rotatory motion. Nay, it is often produced from an affection of the mind itself, as from beholding any thing turned swiftly round, or a great cataract, or looking down a precipice, or even by intense thought without looking at any thing.

Though a vertigo be for the most part a symptom and concomitant of other diseases, yet it is sometimes a primary disease, returning at intervals, increasing gradually, and equally impeding and destroying the functions of the body and mind.

Internal Senses. 83 Memory. After having treated of the external senses, doctor Gregory next proceeds to consider those properly called *internal;* which are, the *memory*, the *imagination*, and the *judgment*. The first is lessened, disturbed, or even totally destroyed, in many diseases, especially those which affect the brain; as the apoplexy, palsy, internal tumors of the head, external violence applied, fevers, especially those in which there is an increased motion of the blood towards the head, or where the brain is any other way very much affected. It is very rarely, however, depraved in such a manner that ideas are not represented to the mind in their proper order; or if at any time such a disorder occurs, it is considered rather as a disorder of the imagination, or as a delirium, than a failure of the memory. The mind is said to be disordered when the perceptions of memory or imagination are confounded with those of sense, and of consequence those things believed to be now present which are really past or which never existed; or when the sense of the person concerning ordinary things is different from that of other people. The general name for such disorders is *vesania:* if from fever, it is called *delirium*. A general fury without a fever, is called *mania*, or *madness:* but a partial madness, on one or two points, the judgment remaining sound in all other respects, is called *melancholia*. There is, however, no exact and accurate limits between a sound mind and madness. All immoderate vivacity borders upon madness; and, on the other hand, a sorrowful and gloomy disposition approaches to melancholy.

84 Delirium. Delirium accompanies fevers of many different kinds. Sometimes it is slight, easily removed, and scarce to be accounted a bad sign. Often, however, it is very violent, and one of the very worst of signs, requiring the utmost care and attention.

A delirium is either fierce or mild. The fierce delirium is preceded and accompanied by a redness of the countenance, a pain of the head, a great beating of the arteries, and noise in the ears; the eyes in the mean time looking red, inflamed, fierce, shining, and unable to bear the light; there is either no sleep at all, or sleep troubled with horrid dreams; the wonted manners are changed; an unusual peevishness and ill-nature prevail. The depravation of judgment is first observed between sleep and waking, and by the person's crediting his imagination, while the perceptions of sense are neglected, and the ideas of memory occur in an irregular manner. Fury at last takes place, and sometimes an unusual and incredible degree of bodily strength, so that several people can scarce keep a single patient in his bed.

The mild delirium, on the contrary, is often accompanied with a weak pulse, a pale collapsed countenance, and a vertigo when the patient sits in an erect posture; he is seldom angry, but often stupid, and sometimes remarkably grieved and fearful. The loss of judgment, as in the former kind, is first perceived when the patient is half awake; but a temporary recovery ensues upon the admission of the light and the conversation of his friends. The patient mutters much to himself, and attends little to the things around him; at last, becoming quite stupid, he neither feels the sen-

Delirium. ſenſations of hunger or thirſt, nor any of the other propenſities of nature, by which means the urine and excrements are voided involuntarily. As the diſorder increaſes, it terminates in ſubſultus tendinum, tremors, convulſions, fainting, and death. The other ſpecies of delirium alſo frequently terminates in this, when the ſpirits and ſtrength of the patient begin to fail.

The ſymptoms accompanying either of theſe kinds of delirium ſhow an unuſual, inordinate, and unequal motion of the blood through the brain, and a great change in that ſtate of it which is neceſſary to the exerciſe of the mental powers. It is ſufficiently probable, that an inflammation of the brain, more or leſs violent and general, ſometimes takes place, although the ſigns of univerſal inflammation are frequently ſlight. This we learn from the diſſection of dead bodies, which often ſhow an unuſual redneſs of the brain or of ſome of its parts, or ſometimes an effuſion or ſuppuration.

The ſtate of the brain, however, may be much affected, and a delirium induced, by many other cauſes beſides the motion of the blood. In many fevers, typhus, for inſtance, the nervous ſyſtem itſelf is much ſooner and more affected than the blood; and though the morbid affections of the nervous ſyſtem are as inviſible to the ſenſes as the healthy ſtate of it, the ſymptoms of its injuries plainly ſhow that its action, or *excitement* as ſome call it, is unequal and inordinate. In this way, too, a delirium is produced by ſeveral poiſons.

85 Melancholy and mania. The pathology of melancholy and mania is much more obſcure; as coming on without any fever, or diſturbance in the blood's motion. Often alſo they are hereditary, depending on the original ſtructure of the body, eſpecially of the brain; the fault of which, however, cannot be detected by the niceſt anatomiſt. But it is well known, that various diſeaſes of the brain, obſtructions, tumors, either of the brain itſelf, or of the cranium preſſing upon it, any injury done to the head, and, as ſome phyſicians relate, the hardneſs and dryneſs of the brain, and ſome peculiar irritations affecting the nervous ſyſtem, are capable of bringing on this malady. And indeed ſo great are the irritations affecting the nervous ſyſtem in mad people, that they often ſleep little or none for a long time.—Yet even this ſo defective and imperfect knowledge of the diſeaſes of the brain and nerves, is by no means free from difficulties. For though we know that the brain, or a certain part of it, is hurt, or that it is irritated by a ſwelling, or a pointed bone growing into it, nobody can foretel how great, or what may be the nature of the malady from ſuch a hurt: for examples are not wanting of people who, after loſing a large part of the brain, have recovered and lived a long time; or of thoſe who have perceived no inconvenience from a large portion of that viſcus being corrupted, until at length they have fallen ſuddenly down and died in convulſions.

86 Idiotiſm. Another diſeaſe of the internal ſenſes, quite different from theſe, is *fatuity* or *idiotiſm*. Thoſe are called *idiots* who are deſtitute either of judgment or memory, or elſe have theſe faculties unequal to the common offices of life. A kind of idiotiſm is natural and common to all infants; neither is it to be accounted a diſeaſe: but if it laſts beyond the ſtate of infancy, it is a real diſeaſe, and for the moſt part incurable. It has the ſame cauſes with the other diſeaſes of the internal ſenſes: although theſe can ſcarcely be detected by the eye or by the knife of the anatomiſt. It frequently accompanies, or is the effect of, epilepſy. Hence, if the epilepſy derives its origin from cauſes not ſeated in the head, as from worms lodging in the inteſtines, the fatuity may be cured by diſlodging theſe, and removing the epilepſy. It is not unlikely that the fatuity of children, and the dotage of old men, may ariſe from the brain being in the former too ſoft and in the latter too hard.

87 Diſorders in the muſcular power. The muſcular power may be diſeaſed in a great number of ways. The mobility itſelf may be too great; but this muſt be carefully diſtinguiſhed from vigour. By mobility is meant the eaſe with which the muſcular fibres are excited into contraction. The vigour, on the other hand, is that power with which the contraction is performed. They are ſometimes joined, but more frequently ſeparate, and for the moſt part the exceſſes of each are owing to contrary cauſes.

88 Mobility. Too great mobility is when motions are excited by too ſlight a ſtimulus, or when too violent motions are produced by the cuſtomary ſtimulus. A certain habit of body, ſometimes hereditary, renders people liable to this diſeaſe. Women have a greater ſhare of mobility than men have. Infants have a great deal of mobility, often too great; youth has leſs than infancy, but more than man's eſtate; though old age has commonly too little. A lazy, ſedentary life, full diet, a ſuppreſſion of the uſual evacuations, fulneſs of the blood-veſſels, and ſometimes their being ſuddenly emptied, laxity, flaccidity of the ſolids in general, but ſometimes too great a tenſion of the moving fibres, the uſe of diluents, eſpecially when warm, or heat applied in any manner, produce too great mobility. And this may be either general or particular, according as the cauſes have been applied to the whole body or only to a part of it.

89 Vigour. Vigour in general is rarely morbid; although ſometimes certain muſcular parts appear to have too great ſtrength. In maniacs and phrenitics, an immenſe ſtrength is obſerved in all the muſcles, eſpecially in thoſe that ſerve for voluntary motion; which is not unjuſtly reckoned morbid. The reaſon of this exceſs is very obſcure; however, it is plainly to be referred to a diſeaſed ſtate of the brain.

A more frequent and more important exceſs of vigour is obſerved in thoſe muſcular fibres that do not obey the will, ſuch as thoſe which move the blood. Its circulation is thus often increaſed, not without great inconvenience and danger to the patient. But a ſlighter exceſs of this kind, pervading the whole body, renders people apt to receive inflammatory diſeaſes, and is uſually called a *phlogiſtic diatheſis*. But this is better obſerved when local, as in inflammation itſelf.

Too great vigour of the muſcular fibres may ariſe from the nervous power increaſed beyond meaſure, as in mania, phrenitis, or violent affections of the mind; from too great a tenſion of the fibres, by which they more eaſily and vehemently conceive motions, as of the arteries when filled with too much blood; from catching cold, by being expoſed either to cold or heat, as uſually happens in the ſpring; or laſtly, though the nervous power and tenſion of the fibres ſhould

ſhould not at all be changed, their action may become too great, from a ſtimulus more violent than uſual being applied, or from the uſual ſtimulus if the fibres themſelves have already acquired too great a ſhare of mobility.

90 Torpor. The oppoſite to too great mobility is torpor, and to too great vigour is debility. Torpor is ſuch a diminution of mobility as renders the parts unequal to their functions. It ariſes from cauſes directly oppoſite to mobility; ſuch as, in the firſt place, a harder and more rigid contexture of the parts themſelves, or even ſometimes from one too lax and flaccid; from old age; from ſome peculiar temperament of body, ſuch as one phlegmatic, frigid, or inſenſible; too great and inceſſant labour, cold, ſpare diet, and an exhauſted body. This evil is the more to be dreaded, becauſe, the powers of the body being deficient, nature is neither able to make any effort of herſelf, nor are the remedies, in other caſes the moſt efficacious, capable of affording her any aſſiſtance.

91 Debility. Debility takes place, when the motion of the muſcles, either voluntary or involuntary, is not performed with ſufficient ſtrength. A greater or leſſer ſhare of debility, either general or of ſome particular part, accompanies almoſt all diſeaſes, and is indeed no ſmall part of them: for it is hardly poſſible that a diſeaſe can ſubſiſt for any length of time without inducing ſome degree of debility. When a ſtate of debility is induced, it renders a man obnoxious to innumerable diſorders, and throws him as it were defenceleſs in their way. It often depends on the original ſtructure of the body, ſo that it can be corrected neither by regimen nor medicines of any kind. A different degree of ſtrength alſo accompanies the different ages of mankind; and thus, in ſome caſes, debility cannot be reckoned morbid. But a truly morbid and unwonted debility ariſes from the nervous force being diminiſhed; from diſeaſes of the brain and nerves, or of the muſcles through which they are diſtributed; from a decay of the nerves themſelves; from a want of the due tenſion of the fibres, or the fibres themſelves becoming torpid; from the body exhauſted by ſpare diet, want, evacuations; or laſtly, from diſeaſes affecting the whole body, or ſome particular parts of it.

92 Palſy. The higheſt degree of debility, namely, when the ſtrength of the muſcles is altogether or nearly deſtroyed, is called *paralyſis* or *palſy*; and is either univerſal, or belonging only to ſome particular muſcles. An univerſal palſy ariſes from diſeaſes of the brain and nerves, ſometimes very obſcure, and not to be diſcovered by the anatomiſt; for the nervous power itſelf is often deficient, even when the ſtructure of the nerves remains unhurt: yet often a compreſſion, obſtruction, or injury of the veſſels, extravaſation of blood, or ſerum, collections of pus, ſwellings, &c. are diſcovered. It frequently ariſes from certain poiſons acting on the nerves; from the fumes of metals; from the diſeaſes of parts, and affections of the muſcles, very remote from the brain, as in the colic of Poictou. A palſy of ſingle muſcles, but leſs perfect, often ariſes without any defect of the brain or nerves, from any violent and continued pain, inflammation, too great tenſion, relaxation, reſt, or deſtruction of the contexture of the parts, ſuch as commonly happens after the rheumatiſm, gout, luxations, fractures of the bones, and iſchuria.

An *univerſal* palſy, however, as it is called, ſeldom affects the whole body, even though it ſhould originate from a diſeaſe of the brain. We moſt commonly ſee thoſe who are paralytic affected only on one ſide, which is called an *hemiplegia*. It is ſaid that the ſide of the body oppoſite to the diſeaſed ſide of the brain is moſt commonly affected. If all the parts below the head become paralytic, it is called a *paraplegia*. In theſe diſeaſes the ſenſes for the moſt part remain; though ſometimes they are aboliſhed, and at others rendered dull. Sometimes, tho' rarely, and which is an exceeding bad ſymptom, the motion, ſenſation, pulſe, and heat of the paralytic limbs are loſt; in which caſe the arteries themſeves become paralytic. A palſy of the whole body, as far as regards the voluntary motions, with anæſtheſia and ſleep, is called an *apoplexy*. This proceeds from ſome injury of the brain: though a ſtate very ſimilar to it is induced by narcotics, opium, wine itſelf, or any generous liquor taken to exceſs; and laſtly, by breathing in air corrupted by noxious impregnations, ſuch as a large proportion of carbonic acid, hydrogenous gas, or any ſimilar active aeriform fluid

Another diſeaſe to which muſcular motion is liable, and that neither ſlight nor unfrequent, is called *ſpaſm*. 93 Spaſm. This is a violent and irregular motion of the muſcles. Of ſpaſms there are two kinds, the tonic and clonic. The latter is frequently called a *convulſion*; in order to diſtinguiſh it from the other, which is more peculiarly called *ſpaſm*.

Spaſm therefore is a violent, conſtant, and preternatural contraction of the muſcular fibres; but a convulſion is an unuſual and violent contraction alternated with relaxation. People are rendered liable to ſpaſm by too ſenſible an habit of body, or too great mobility; and hence it is a diſeaſe common in women, in infants, and in weak, luxurious, lazy, and plethoric people. It is brought on thoſe already prediſpoſed to it, by any kind of ſtimulus applied to the brain, or to any nerve, muſcle, or nervous part connected with it: of which we have examples in dentition; worms lodged in the inteſtines, and irritating them; any acrid matter infecting the blood, or much affecting the ſtomach and inteſtines; the irritation of any nerve, or of the brain itſelf, by an exoſtoſis, ſwelling, too great fulneſs of the veſſels, pain, vehement affections of the mind, ſudden evacuation, or poiſons admitted into the body. Frequently, however, the malady originates from ſlight cauſes, little known, and not eaſily obſerved.

Spaſm is both the cauſe and effect, and frequently conſtitutes the greateſt part, of moſt diſeaſes. It is often very difficult either to be known or cured; becauſe it is ſo multiform, and produces as many different ſymptoms as there are organs affected; of which it ſurpriſingly diſturbs, impedes, or increaſes the functions. It is a diſeaſe ſeated in the original ſtamina of the conſtitution; and neither to be removed by ſlight remedies, nor in a ſhort time.

With regard to ſleep, Dr Gregory obſerves, that its 94 Sleep. uſe is ſufficiently apparent from the effects which it produces in the body. It reſtores the powers both of mind and body when exhauſted by exerciſe, giving vigour to the one, and reſtoring its wonted alacrity to the

Disorders of Sleep.

the other. It renders the muscles again active and moveable, after they have become wearied, rigid, painful, and trembling by hard labour. It moderates the quickness of the pulse, which usually increases at night, and brings it back to its morning standard. It seems also to assist the digestion of the aliment; lessens both the secretions and excretions; and renders the fluids thicker than otherwise they would be, especially in a body endowed with little sensibility or mobility. Hence sleep is not only useful, but absolutely necessary for preserving life and health; and is a most excellent remedy both for alleviating, and totally removing, a great many diseases.

Want of sleep is hurtful in a great many different ways, especially to the nervous system. It renders the organs of sense both external and internal, as well as those of every kind of motion, unfit for performing their offices. Hence the sensations are either abolished, or become imperfect or depraved; and hence imbecility of mind, defect of memory, a kind of delirium, mania itself, pain of the head, weakness of the joints, an imperfect or inordinate action of the vital organs, quickness of pulse, heat, fever, depraved digestion, atrophy, leanness, and an increase or perturbation of the secretions and excretions.

Sleep may be prevented both in healthy and sick people from various causes; such as strong light, noise, pain, anger, joy, grief, fear, anxiety, hunger, thirst, vehement desire, motion of the body, memory, imagination, intense thought, &c. On the other hand, sleep is brought on by a slight impression on the organs of sense, or none at all; by the humming of bees, the noise of falling water, cold and insipid discourse; or lastly, by such an exercise of the memory as is neither too laborious nor disturbing to the mind.—Too great an impulse of the blood towards the head, such as often happens in fevers, prevents sleep; but a free and equal distribution of the blood through the whole body, especially the extreme parts, frequently brings it on. Whatever weakens the body also favours sleep; and hence various kinds of evacuations, the warm bath, fomentations, sometimes heat itself, are useful for promoting it. It also comes on easily after taking food, or indulging venery; the violent sensation being then quieted, and the body itself somewhat weakened. Cold produces a deep sleep of long continuance, not easily disturbed, and often terminating in death. Lastly, there are certain substances which, when applied to the body, not only do not excite the nervous system, but plainly lay us asleep, and render us unfit for sensation: of this kind are those called *narcotics*, as opium and the like; among which also we may reckon wine taken in too great quantity. Lastly, watching itself is often the cause of sleep; because while a man is awake he always more or less exercises the organs of his body, by which the nervous influence is diminished, and thus the more violently the body is exercised, in the same proportion is the person under a necessity of sleeping.

Sleep is deficient in many diseases; for there are few which do not excite pain, anxiety, or uneasiness, sufficient to prevent the approach of sleep, or to disturb it. Fevers generally cause those who labour under them to sleep ill; as well on account of the uneasiness which accompanies this kind of diseases, as by reason of the impetus of the blood towards the head being frequently increased; and likewise from the stomach being disordered, loaded with meat, or distended with drink. Hence also we may see the reason why many hypochondriac and hysteric patients sleep so ill; because they have a bad digestion, and their stomach is disposed to receive many though frequently slight disorders; the slightest of which, however, is sufficient to deprive the patient of rest, provided the body be already irritable, and endowed with too great a share of mobility.

Want of sleep will hurt in diseases as well as in health; and for the same reason; but in a greater degree, and more quickly, in the former than in the latter; and is therefore not only a very troublesome symptom of itself, but often produces other very dangerous ones.

Too much sleep, on the other hand, produces many mischiefs, rendering the whole body weak, torpid, and lazy; and it even almost takes away the judgment. It also disturbs the circulation, and diminishes most of the secretions and excretions. Hence plethora, fatness, flaccidity, and an inability for the common offices of life.—The causes of this excess are, either the usual causes of sleep above-mentioned increased beyond measure, or some fault in the brain, or a compression of it by an extravasation of the humours; or sometimes, as it would seem, from great debility produced by an unusual cause, as in those who are recovering from typhous fevers and other diseases. In these examples, however, this excess of sleep is by no means hurtful; nor even, perhaps, in these cases where an excess of grief continued for a long time, or a great fright, have produced a surprising and unexpected somnolency. Lastly, many people have accustomed themselves, and that not without a great deal of hurt to their constitutions, to sleep too much. Nor are there examples wanting of some who have passed whole days, and even months, in sleep almost uninterrupted.

With regard to the manner in which the circulation of the blood is performed, and the various principles of which it is composed, see the articles Blood, and Anatomy. As for the disorders to which the blood and its circulation are subject, Dr Gregory observes, that in our younger years the veins are much more dense, firm, and strong, than the arteries; but the latter, by reason of the continual pressure upon them, and the strength which they exert, become daily more firm, hard, and strong, until at last they equal or exceed the veins themselves in strength; and it is not uncommon in old men to find some part of the arteries converted into an horny substance, or even into a solid bone. Hence in the state of infancy the greatest part of the blood is contained in the arteries, and in old age in the veins; an affair indeed of no small moment, as it shows the reason in some measure of the state of increase and decrease of the body. Besides, if any disease happens from too great a quantity of blood, it thence appears that it must show itself in young subjects in the arteries, and in old ones in the veins; and this is the reason of many diseases which accompany certain periods of life. 95 Circulation.

In most, if not in all species of animals, the arteries of the females are much more lax and capacious when compared with the veins, and the veins much less, than in

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in the males of the fame genus. The defign of nature in this conformation, is probably that they may be the better able to nourifh the fœtus in their womb. The fame likewife feems to be the reafon why women are more inclined to plethora than men; and to this greater capacity of the arteries and fmallnefs of the veins are we to afcribe that beauty and elegant fhape of the arms in women, not disfigured or livid with veins as in men.

The blood is alfo diftributed in various proportions to the different parts of the body, and that proportion too differs at different periods of our lives. At firft an immenfe quantity is fent to the head, becaufe that part of the body is firft to be evolved and fitted for its offices: but as foon as the parts begin to make a confiderable refiftance to the efforts of the blood, and the veffels cannot eafily be further dilated, it is neceffarily fent off to other parts; by which means the reft of the body increafes in bulk, and becomes fitted for performing its proper functions. The effect of this change is alfo very foon obferved, namely, when none of the blood paffes through the navel, and of confequence a greater quantity is fent by the iliac arteries to the inferior extremities. Thefe, though fo fmall and flender in the fœtus, increafe very fuddenly; fo that often in not many months the child can not only ftand on its feet, but even walk tolerably well.

96 Pulfation of the arteries.

Phyficians are wont to judge of the ftate of the circulation by the pulfe; which indeed is very various, as well with regard to its frequency, as to the ftrength and equality of its ftrokes and intervals.—Its common quicknefs in a healthy grown-up perfon is about 70 ftrokes in a minute. In a fœtus, perhaps, it is more than double; and in an infant a few months old, hardly lefs than 120. As we grow up, this quicknefs gradually diminifhes; fo that in extreme old age it fometimes does not exceed 50, or is even flower. This rule however, is not without exceptions: for many, efpecially thofe of an irritable habit, have the pulfe much quicker; while others, even in the vigour of their age, have the pulfe remarkably flow. It is for the moft part fomewhat quicker in women than in men.

The pulfe is alfo rendered quicker, both in a healthy and difeafed body, by the application of ftimuli of many different kinds. Exercife efpecially, by accelerating the return of the blood through the veins, increafes the quicknefs of the pulfe to a furprifing degree. Various kinds of irritations affecting the nervous fyftem, as intenfe thinking, paffions of the mind, pain, heat, ftimulating medicines, wine, fpices, &c. likewife produce the fame effect. The acrimony of the blood itfelf alfo is thought to quicken the pulfe.

When a perfon firft awakes in the morning, the pulfe is flow, but becomes quicker by degrees on account of the many irritating matters applied to the body. Its quicknefs is increafed after taking food, efpecially of the animal kind, or fuch as is hot or feafoned with fpices. In the evening a flight fever comes on, for which reft and fleep are the remedy. Thefe things, however, are fcarce to be obferved in a healthy perfon, but are very evident in one that is feverifh, efpecially when the difeafe is a hectic.—Again, even debility itfelf often renders the pulfe quicker than ufual; becaufe the ventricle of the heart not being quite emptied, it is the fooner dilated again, and of confequence contracts the fooner. For this reafon a phyfician can never judge of the ftrength of the circulation from the frequency of the pulfe.

Laftly, in all fevers, however different from one another, the pulfe is found to be too quick, partly perhaps from debility, partly from the acrimony of the fluids, and partly from the repulfion of the blood from the furface of the body, and the accumulation of it in the large veffels where it acts as a ftimulus; though it muft be owned, that a great deal of this is obfcure, if not totally unknown; nor in truth are we able to underftand in what manner the *autocrateia* acts with regard to the frequency of the pulfe.

The pulfe is feldom obferved too flow, unlefs when the mobility of the body is much diminifhed, as in decrepid old age, or from a compreffion or difeafe of the brain; but a greater compreffion of the brain ufually produces a ftill more remarkable flownefs of the pulfe, as in the hydrocephalus, apoplexy, &c.—Sometimes alfo the pulfe is too flow in thofe who are recovering from tedious fevers. But this is a matter of little moment, and feems to be owing to fome kind of torpor. Indeed it has generally been confidered as a mark of a thorough and complete folution of the fever; for it is commonly obferved, that when this ftate of the pulfe takes place, the patient feldom fuffers a relapfe.

While the frequency of the pulfe continues the fame, its ftrokes may be either full, great, ftrong, and hard; or foft, fmall, and weak. A full, great, and ftrong pulfe takes place when the ventricle ftrongly and completely empties itfelf; throwing out a great quantity of blood into the arteries, which fully diftends them and ftimulates them to a ftrong contraction. A pulfe of this kind is common in ftrong healthy men, and is feldom to be accounted a fymptom of difeafe. But if it be too ftrong, and ftrike the finger of the perfon who feels it violently and fharply, it is called a *hard pulfe*. This hardnefs is produced by a fudden and violent contraction of the heart and arteries, which diftends even the remote branches, as thofe of the wrift, too fuddenly and fmartly, and excites them alfo to fudden and violent contractions.

A hard pulfe therefore denotes too great an action of the heart and arteries. It may arife from various caufes: in the firft place, from too great a tenfion of the veffels; for inftance, from their being too full, and by that means more prone to motion, and the more fit for receiving violent motions. It may arife alfo from too great a denfity and firmnefs of the folids; and hence it is moft frequent in cold countries, among ftrong robuft people, and fuch as are accuftomed to hard labour. It may likewife arife from various caufes irritating the whole nervous fyftem, or only the heart and arteries. Laftly it accompanies many fevers as well as moft inflammatory diforders, whether the inflammation arifes from a general ftimulus applied to the whole body, or from the irritation of particular parts, by degrees extended over the whole body. In fuch a ftate of the circulation, the patient frequently ftands in need of blood-letting, and almoft always bears it well.

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A fmall, weak, and foft pulfe is generally owing to caufes oppofite to the foregoing and indicates a contrary ftate of the circulation and nervous fyftem. It frequently requires ftimulants; nor does it generally require blood-letting, or eafily bear it. Sometimes, however, a pulfe of this kind is obferved even in the cafe of a dangerous inflammation, of the ftomach for inftance, or inteftines. But in thefe and the like examples, we ought to attend to the nature of the malady, much more than to the ftate of the pulfe.

The pulfe is faid to intermit, when the ftroke does not return after the ufual interval, and perhaps not till after twice, thrice, or four times the ufual fpace. A pulfe of this kind feems to be almoft natural and conftant in fome animals, and is common to fome men even in the moft perfect health; and if thefe happen to be feized with a fever, the pulfe fometimes becomes equal nor can the difeafe be removed before the intermiffion has returned.

Moreover, in fome people, though their pulfe beats equally while in health, yet the flighteft illnefs makes it intermit; and in others, efpecially thofe who have a great deal of mobility in their conftitution, fuch as hypochrondriac and hyfteric people, the intermiffion of the pulfe is felt, without applying the finger to the artery, merely by the uneafinefs which they perceive in their breafts during thofe intervals in which the pulfe is deficient. An intermittent pulfe likewife occurs in many difeafes of the breaft, efpecially when water is collected in it; and the like happens in the end of all difeafes, efpecially fevers, when the ftrength is nearly exhaufted, and death approaches, of which it is frequently the forerunner.

An intermitting pulfe therefore feems to arife from an unequal influx of the nervous power into the heart, or from the decay and exhauftion of the nervous power, by which means the heart is not able to contract till it has been diftended beyond its due pitch. Or laftly, it may arife from difeafes of the organ itfelf, or the neighbouring parts; from fwellings, water, &c. prefsing upon them, and impeding the action of the heart: which indeed is a very dangerous diforder, and almoft always mortal.

Many other variations of the pulfe are enumerated by phyficians, but moft of them uncertain, and not confirmed by experience. We fhall therefore now confider the motion of the blood, which may be either too great, too fmall, or irregular.

A quick pulfe, *cæteris paribus*, produces a more rapid circulation, becaufe the fooner that the ventricle of the heart is emptied, the more quickly is the blood thrown into the arteries; and their actions muft anfwer to this ftronger ftimulus. Hence exercife, heat, ftimulants, plethora, every kind of irritation, paffions of the mind, and fever, increafe the circulation. The effect of this increafe is a diftenfion of the veffels, a ftimulus applied to the whole body, an increafe of heat, and often a debility. The fecretion of fweat is increafed while the other fecretions are diminifhed, and the various functions of the body impeded; thirft comes on, the appetite is loft, the fat confumed, and a difpofition to putrefcency introduced. Sometimes the fmaller veffels are burft; whence effufions of blood and hæmorrhages But we are by no means to forget, that this violent motion of the blood, however hurtful it may feem, is among the beft remedies made ufe of by nature in curing many difeafes.

The motion of the blood is diminifhed, efpecially by debility torpor the want of irritation or of exercife: the fame thing happens to all the humours, if there be any obftruction in the veffels, or any caufe by which their return is hindered or rendered more difficult. Thus, from the very weight of the blood itfelf, if a perfon has ftood long on his feet, the humours return more flowly from the inferior extremities. Any difeafe of the heart and arteries alfo as an aneurifm, contraction, offification, muft neceffarily obftruct the circulation. The fame thing happens from obftructions of the veins, or interrupted refpiration, by which the paffage of the blood through the lungs to the left fide of the heart is impeded.

But, from whatever caufes this diminution of the circulation takes place, the bad confequences are perceived chiefly in the veins, becaufe in them the blood always moves more flowly than in the arteries. Hence varices, and congeftions of blood, efpecially in thofe parts of the body where the veins are deftitute of valves, and of confequence where the motion of the mufcles cannot affift the circulation. Hence alfo arife dropfies from an impeded or languid motion of the blood; becaufe the refiftance of the veins being increafed, the blood is received into them with the greater difficulty, and more of the thin humour is driven into the exhaling veffels, and by them depofited in fuch quantities as cannot be reabforbed by the lymphatics. Thefe difeafes, as well as all others proceeding from defects of the circulation, are alfo more difficult of cure than others, becaufe all the vital powers are weakened at the fame time.

Another diforder of the circulation is where the blood is carried to one part of the body in too great quantity, by which means the other parts are deprived of their due proportion. This irregular diftribution of the vital fluid frequently arifes from a ftimulus applied to the part itfelf, or to the brain, or at length acting on the mind, which, according to the laws of fympathy, produces a certain and definite diftribution of the blood. It arifes alfo not unfrequently from a fpafm taking place in fome other parts, which drives the blood out of its ordinary courfe.

In proportion to this irregularity of the circulation are the confequences; heat, fwelling, rednefs, inflammation, rupture of veffels, hæmorrhages, effufions, deftruction, corruption, and fuppuration of the cellular texture and adjoining parts, &c. Even this evil, however, nature often converts into an excellent remedy; and phyficians, following her fteps, frequently attempt to direct the diftribution of the blood in particular difeafes, well knowing that a change in the diftribution of the blood is frequently efficacious either for radically curing fome difeafes or relieving their moft urgent fymptoms

97 Palpitation.

Laftly, fome diforders in the motion of the heart itfelf, and thofe of no fmall confequence, remain yet to be taken notice of, namely, palpitation and fyncope. A palpitation is a violent and irregular action of the heart, fuch as for the moft part is perceived by the patient himfelf, and that not without a great deal of uneafinefs and oppreffion at his breaft; and is alfo manifeft to the by-ftanders if they apply their hands, or look

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look at his naked breaft; the pulfe of the arteries in the mean time being weak, unequal, and intermitting. This is a fpafmodic diforder; and is induced by various caufes affecting either the nervous fyftem in general, or the heart in particular. Every difeafe of the organ itfelf, fuch as a conftriction of its valves and blood-veffels, an offification, enlargement, or polypus, hindering the free action of the heart, and evacuation of blood from it, are capable of exciting it to violent and unufual contractions. The fame effect will alfo follow plethora, or too violent an impulfe of the blood, &c. The heart will likewife frequently palpitate from a violent excitement of the nervous fyftem, efpecially where the conftitution is endowed with a great deal of mobility. Hence palpitations from any affection of the mind, and in hyfteric women. Palpitation may likewife arife from an affection of the ftomach, occafioned by worms, a furfeit, flatus, or ftimulation by various acrid fubftances. It frequently alfo accompanies the gout when driven back, or even when a fit is coming on. Sometimes it arifes from debility, whatever may be the caufe; frequently from any difficulty in breathing; and many of thefe caufes may be joined at the fame time, or fome of them produce others.

Hence we may fee why the evil is fometimes flight and of fhort continuance; at other times altogether incurable, and certainly mortal in a longer or fhorter time; why it fometimes returns at intervals, often coming on and being increafed by every kind of irritation and exercife, and fometimes relieved or totally removed by ftimulants or exercife.

98 Syncope.

A fyncope is when the action of the heart, and, along with it that of the arteries, is fuddenly and very much leffened; whence the animal-powers, the fenfes, and voluntary motions, immediately ceafe. This may be produced by almoft all the caufes of palpitation; becaufe whatever can difturb and diforder the motion of the heart, may alfo weaken or fufpend it. The vitiated ftructure of the heart itfelf therefore, violent paffions of the mind, whether of the depreffing kind, or thofe which fuddenly and vehemently excite, various kinds of nervous difeafes, thofe of the ftomach, every kind of debility and evacuation, efpecially a great lofs of blood, exceffive and unremitting labour, long watching, heat, pain, many kinds of poifons, &c. produce fainting.

Hence we fee, that whatever weakens the motion of the blood through the brain tends to produce fainting; and, on the contrary, whatever tends to augment that motion, alfo tends to refrefh, and prevent the perfon from fainting. Hence alfo we fee how the mere pofture of the body may either bring on or keep off fainting, or remove it after it has already come on. We likewife fee how this diforder may fometimes be of little confequence and eafily removed; at others very dangerous, not only as a fymptom, but in even itfelf, as fometimes terminating in death; and laftly, how it may be ufed as a remedy by a fkilful phyfician, and artificially induced, either to free the patient from violent pain, or to ftop an immoderate effufion of blood fcarce to be reftrained by any other method.

99 Buff-coloured cruft on the blood.

With regard to the diforders of the blood itfelf, Dr Gregory obferves, that the glutinous part of it produces that buff-coloured appearance often feen upon blood drawn from people afflicted with inflammatory diforders, and even fometimes when no fuch difeafes are prefent. This cruft indeed is nothing elfe than the pure gluten of the blood taking longer time than ufual to coagulate, by which means the red particles have an opportunity of falling to the bottom. This indicates no lentor, denfity, thicknefs, or tenacity of the blood, as was formerly thought; but rather its thinnefs, or at leaft a lefs tendency in it to coagulate. It arifes for the moft part from a violent agitation and conquaffation of the blood within the body; and hence it accompanies many fevers, all inflammations, fometimes hæmorrhages, exanthemata, plethora, pain, and many irritations. It muft however be allowed, that in feveral of thefe difeafes it is rendered highly probable, at leaft from experiments apparently accurate, that the quantity of the gluten of the blood is really encreafed in the proportion which it bears to the other parts. This cruft, however, is not always to be accounted morbid, as it often happens to the moft healthy; and may even be produced or deftroyed by the flighteft caufes while the blood is running from the vein, fo that frequently we fhall fee a very thick and tenacious cruft on the blood flowing into one cup, while that which runs into another has little or none at all. In general, however, the appearance of this cruft fhows, that the patient will bear bloodletting well, though thofe have been in a great miftake who directed this operation to be repeated till no more cruft appeared on the blood.

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The glutinous part of the blood alfo frequently produces thofe maffes called *polypi*, which fometimes take place during life, but more frequently after death, in the large veffels near the heart, or even in the cavities of that organ. Similar maffes alfo are frequently formed in the uterus, and are called *moles*.

The quantity of blood contained in a healthy body is very various, and difficult to be afcertained. Many difeafes, however, may arife from its being either too fcanty or too abundant. Too great a quantity of blood is produced by the ufe of rich, nourifhing diet, ftrong drink, accompanied with a good digeftion; from a lazy, fedentary life, or much fleep, efpecially in thofe who have been formerly accuftomed to much exercife; with many other caufes of the fame kind. It renders the perfon dull, weak, and languid, and fometimes almoft totally oppreffes him; nor are thofe organs deftined for moving the blood fufficient for driving forward fuch a load. The pulfe finks; and fometimes a fyncope, vertigo, or palpitation takes place. More frequently, however, the veffels are too much diftended, and ready to be thrown into violent and irregular motions. Hence a difpofition to fevers, inflammations, an unequal diftribution of the blood, unufual congeftions, rupture of the veffels, and hæmorrhages. Moreover, by reafon of the clofe connection between the fanguiferous and the nervous fyftem, a fulnefs of blood produces a difpofition to fpafm and other difeafes of that kind. 100 Plethora.

Hence we may underftand why a plethora is fometimes accompanied with a weak and fometimes with a ftrong and hard pulfe, why it is the caufe as well as a part of fo many diftempers, why it is the effect of a high ftate of health, &c.

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The want of a due quantity of blood is no lefs pernicious than too great an abundance of it. It debilitates the perfon, and renders him unable to perform the proper offices of life; produces a languid circulation, fyncope, fpafms, and at laft death itfelf. In a flighter degree of the difeafe the body is emaciated through want of nourifhment, and its functions are vitiated in various ways. It may arife from want, bad food, or fuch as affords little nourifhment: from bad digeftion, or the chyle being hindered from paffing into the blood: from fevers, or other difeafes which exhauft the body and hinder nutrition: or laftly, from various evacuations, particularly of blood; and that the more efpecially if they are fudden, for in flow evacuations the veffels accommodate themfelves furprifingly to the quantity left in them. Befides, if the body be flowly exhaufted, the excretions are leffened by reafon of the deficiency of the vital power; fo that the unufual expence is eafily compenfated by the unufual retention. But if the evacuation happens to be very fudden and great, it may either prove mortal in a fhort time, or break the conftitution to a degree beyond recovery.

101 Inanition.

102 Morbid thinnefs of the blood.

By a great and long-continued deficiency of blood the quality of it alfo is impaired; becaufe the thin part of it is eafily and foon made up; but the glutinous, thick, and red part, not fo eafily. Hence the blood becomes thin, pale, fcarcely capable of coagulation, or of affording a proper fupport to the body. Too great thinnefs of the blood alfo proceeds from ufing much drink, efpecially of the aqueous kind, flender and little nourifhing diet, a bad digeftion in the ftomach; from difeafes of the lungs and thofe organs which elaborate the red part; or from fuppreffions of the ufual evacuations of thin humours, as fweat or urine, induced by cold, a fault of the fecreting organs, or by putrefcency. But along with this other diforders of the blood concur.

A too thin and watery blood makes the face pale, the body weak, languid, and torpid; the folid parts become flaccid from want of nourifhment, and having too great a quantity of water in their compofition. It brings on hydropic effufions of water in all parts of the body, by reafon of the increafed exhalation of that thin fluid which moiftens all the inward parts; partly by reafon of the blood itfelf being in fome meafure diffolved, fo that it paffes out of the veffels more eafily and plentifully than it ought to do; and partly by reafon of the veffels being relaxed beyond their ufual pitch, and not making a proper refiftance. Befides, in this cafe, the lymphatics are fo far from abforbing more than ufual, that, partaking likewife of the general debility, they are fcarce fufficient for performing their proper offices.

Nature, however, has taken care, by the moft fimple means, to provide againft fo many and fo great evils; for neither does the blood fo eafily become thin as fome have imagined, nor when this quality takes place does it want a proper remedy. For almoft inftantly, if the perfon be otherwife in health, the excretions of the thinner matters are greatly augmented, and the whole mafs of blood in a fhort time becomes as thick as formerly.

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The oppofite to this, namely, too great a thicknefs of the blood, though often fpoken of by phyficians, is very rarely if ever obferved; and thofe fevers and inflammations which have been thought to arife from thence, are now found to originate from other caufes. The following would feem to be the law of the human conftitution. As foon as the blood has attained the due degree of thicknefs, or gone in the leaft beyond it, the excretions are either fuppreffed or diminifhed, the body attracts more moifture from the air, the perfon is thirfty, and drinks as much as is neceffary for diluting the blood. But if water be wanting, and the perfon cannot fatisfy his thirft, then the blood is fo far from being thickened that by reafon of a putrefcency begun or augmented, it is much diffolved, becomes acrid, and is with difficulty contained in the veffels.

103 Acrimony of the blood.

The acrimony of the fluids has afforded a large field for declamation to the fpeculative phyficians, and upon this flender foundation many perplexed and intricate theories have been built. It is certain indeed, that the blood in a ftate of health has fome fmall fhare of acrimony; and this acrimony, from certain caufes, may be a little increafed fo as to produce various difeafes of a dangerous nature. This we are affured of from the increafe of motion in the heart and arteries, and the fimilar augmentation of the action of the fecretory organs, from acrid fubftances taken inwardly. The fame thing alfo appears from the unufual acrimony of the fecreted fluids in fuch cafes, by which the veffels are fometimes greatly ftimulated, and fometimes even quite eroded. Very many acrid fubftances, however, are daily taken into the ftomach; fo that thefe muft either be corrected in the *primæ viæ*, or changed by digeftion before they pafs into the blood; or at leaft by dilution with much water, or being blunted by an admixture with gluten, oil, or inflammable air, they muft depofit much of their acrimony, and at laft be thrown out of the body as noxious fubftances. Thus a vaft quantity of falts, acid, alkaline, and neutral, may pafs through the body, without in the leaft affecting the health; though thefe falts, if taken in very large quantity, undiluted, or not thrown out of the body, will do much hurt.

Moreover, even while life continues putrefaction is going on, and produces much of that fubftance called *animal* falt; for into this a great part of our food is converted, and paffes off by the urine. But if this putrefcent difpofition be too great, it will produce too large a quantity of animal falt; efpecially if much of any faline fubftance is otherwife thrown into the body without proper dilution: and this kind of difeafe is well known to failors who have been long at fea without having an opportunity of getting frefh provifions.

For this fpontaneous putrefcency, nature has fuggefted a proper remedy, namely, frefh meat, efpecially of the vegetable and acefcent kind, and fuch as is well impregnated with aerial acid, which it may impart to the body. But where this kind of food is wanting, the putrefaction goes on apace, and a very great thinnefs and acrimony of the juices take place; efpecially if there be alfo a fcarcity of water, or the excretions which ought to carry the putrid matters out of the body languifh, either from cold, floth, torpor, depreffing paffions of the mind, or from the conftitution being broken by difeafes; or laftly, from too great heat, which always favours putrefaction.

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Besides, it would seem, that sometimes a disposition to putrefaction is much increased by the reception of a putrid ferment into the body; of which we have examples in some infectious fevers, where the contagion is very much assisted by heat, animal-diet, certain kinds of salts, dibility and nastiness.

Lastly, any single part of the body may putrefy from various causes, as from inflammation, gangrene, cold, &c. and thus may the whole body be infected; although for the most part the disease proves fatal before the corruption has spread over the whole body.

But when the mass of blood begins to putrefy greatly, it not only becomes very acrid, but thin also, so that it either will not coagulate at all, or shows only a slight and very loose crassamentum. Nay, even the red globules are broke down and destroyed; in which case it necessarily follows, that the blood must become very acrid, as well on account of the evolution of the salt, as by reason of the rancid and putrid gluten, which stimulates, and frequently even erodes, the vessels; producing spots, first red, then livid and black, tumors, and ulcers scarce possible to be cured, without first removing the putrescent disposition of the humours. From the same causes proceed hæmorrhages from every part of the body, hardly to be restrained; a most intolerable fetor of the breath and all the excrements; the highest debility and laxity of the solids; the putrefaction acting as a poison to the nervous system, and at length bringing on death.

An acrimony of the acid kind never takes place in the human blood, nor in any of the humours secreted from it; though one of them, namely the milk, turns acid spontaneously in a very short time after it is drawn from the breast. Neither, indeed, does an alkaline acrimony seem ever to take place in the blood. Putrescency indeed tends this way, and at last terminates in it; but scarcely while the person lives, though the nature of the urine, even while recent, seems to be but little distant from that of an alkali.

Many kinds of acrimony indeed may exist in the blood from too liberal an use of spices, wine, &c. but of these we know nothing certain. We well know, however, that the body is often infected with various kinds of morbid acrimony, which bring on many and dangerous diseases, as the small-pox, measles, cancers, lues venerea, &c. of which the origin and manner of acting are very little understood, though the effects are abundantly evident. In most cases, nature has taken no less care to provide against the *acrimony* than against the too great *thickness* of the blood. Sometimes an antidote is afforded, either by the excitement of thirst, that the acrid substance may be diluted with plenty of drink; or by increasing the evacuations, that it may be thrown out of the body; or lastly, by exciting various motions and actions of the vital powers, by which it may be either subdued, changed, rendered innocent, or expelled from the body by new and unwonted passages.

104 Respiration.

With regard to respiration, Dr Gregory observes, that it may be obstructed from various causes seated either in the lungs themselves or the surrounding parts. But from whatever cause this obstruction may arise, it undoubtedly produces all those diseases which proceed from an interrupted circulation. The lungs themselves also being at length compressed, and not suffered to dilate sufficiently, cannot throw off the vapour which arises from them; and hence they are frequently oppressed with moisture. At the same time they are irritated, so that a greater quantity of mucus, and that of a thicker kind than usual, is secreted; by which means the passages through which the air enters them are stopped up, and a violent cough at length throws off the load

Disorders of Respiration.

The respiration is also subject to some other disorders, as a cough and sneezing; which, though at first sight they may seem very dangerous, are not destitute of use, and may even be reckoned among the most salutary attempts of nature to relieve the patient. Often, however, they are attended with danger, or very great uneasiness; namely, when they are either too violent or exerted in vain. At any rate, it is necessary for a physician to know the nature, causes, and effects, of these, that he may be enabled to promote them when necessary, to moderate them when too violent, and to stop them when noxious or to no purpose.

A cough is a violent, frequently involuntary, and sonorous exspiration, suddenly expelling the air with great force through the glottis somewhat contracted. 105 Cough.
The convulsion of the muscles serving for exspiration, gives a great force to the air, while the contraction of the glottis produces the sound. It is often long continued, being repeated at certain intervals, during each of which the inspiration is imperfect and obstructed by reason of the contraction of the glottis. It is excited by any kind of acrid substance, either chemically or mechanically applied to those passages through which the air enters. These are lined with a membrane so exceedingly delicate and impatient of stimulus, that it cannot even bear the touch of the mildest substance, such as a small drop of water, without throwing the muscles serving for exspiration into a violent convulsion; the glottis at the same time contracting by means of the sympathy between it and the neighbouring parts. Thus the air is thrown out with such violence, that it drives the irritating substance along with it; and thus a cough becomes not only useful, but absolutely necessary for the preservation of life, as being able to free the lungs from every kind of irritating substance or foulness, which might soon bring on a suffocation. Hence a cough is almost an inseparable companion of every inflammation of the lungs, as well as every difficulty in respiration; and even frequently accompanies the entrance of the purest air when the trachea and bronchiæ are excoriated, or become too sensible. Examples also are not wanting, where a violent and troublesome cough has arisen from an irritation of the nervous system, or even of some particular part, of the ear, for instance, the stomach and intestines by worms, the liver by inflammation, &c.

Coughing may also be voluntarily excited, and may then be managed at pleasure. Even when involuntary, it may be moderated, or suppressed, by a contrary effort: though a violent fit of coughing cannot by any means be resisted. When it is once excited, the cough goes on till the irritating substance be expelled, or the sense of irritation abolished, or perhaps overcome by a more uneasy sensation than even the cough itself; after, Disorders of Respiration.

ter which, the irritation again returning at a certain interval, the cough alfo comes on. Hence we are taught a method of allaying and quieting this moft troublefome malady, though frequently it is not in our power to remove the caufe of it altogether.

A very violent cough is often dangerous. For by the retention of the breath, and the ftrong efforts made in coughing, a great quantity of blood is collected in the lungs, of which the veffels are diftended, and frequently broken; and hence there fometimes happens a violent and even fatal hemorrhage. More frequently, however, it is the caufe of a flower, though equally fatal, difeafe. Nay, a frequent and troublefome cough, without any great hemorrhage, or even without any hemorrhage at all, may damage the lungs to fuch a degree, efpecially if they be of a more tender ftructure than ufual, as to lay the foundation of a phthifis almoft always incurable.

Again, by a long-continued and violent cough, the paffage of the blood through the lungs being impeded, it muft neceffarily flow through the veins towards the head: hence rednefs and lividnefs in the countenance, hemorrhages, palfies, apoplexies, and fometimes mortal convulfions. Laftly, by a violent cough the abdominal vifcera are perpetually compreffed with remarkable violence; and if any part happens to be weaker than ufual, a hernia, prolapfus uteri, abortion, or fimilar accidents, may happen.

Even when the cough is more gentle, if it happens to be importunate and frequent, although we have nothing of this kind to fear, yet the patient is by no means free from danger; as he is thereby agitated, fatigued, has his conftitution broken, is deprived of reft, has a fever brought upon him, his lungs are fhaken and irritated, digeftion and all the other functions are impeded, till at laft he finks under a complication of maladies.

106 Sneezing.

Sneezing is fomewhat akin to cough, as confifting of a very full infpiration, to which fucceeds a moft violent exfpiration, by which the air is driven out through the noftrils with immenfe violence, and fweeps the paffage through them as it goes out. It is a convulfion much more violent than a cough, and is befides very difficult to be ftopped when once a propenfity to it has taken place. As a cough proceeds from an irritation of the glottis, trachea, bronchia, and lungs, fo fneezing arifes from an irritation of the membrane of the noftrils, but rarely from fympathy with any diftant part. It is fometimes of fervice, as well as a cough; though it is alfo fometimes prejudicial, for the reafons which have been already affigned.

107 Digeftion.

The laft part of Dr Gregory's treatife neceffary to be taken notice of here, is that which confiders difeafes arifing from a bad digeftion, difordered motion of the inteftines, and fome of the principal fecretions. The firft of thefe, he fays, are fometimes very troublefome, though feldom dangerous. The principal fymptoms are oppreffion, anxiety, pain at the ftomach; eructations, by reafon of air extricated from the fermenting aliments, and irritating the ftomach; naufea and vomiting, from the irritation and diftenfion of the fame organ; the belly fometimes too coftive, and fometimes too loofe; a defect of nourifhment; a general debility; relaxation of the folid parts; too great thinnefs of the fluids; all the functions impeded; pain of the head; vertigo, fyncope, afthma, palpitation; great finking of the fpirits, efpecially if the patient has been of a peculiar conftitution; fometimes the gout, fometimes a dropfy, or a flow fever which may prove mortal.

Diforders of Digeftion.

108 Coftivenefs.

The motion of the inteftines may be either too great or too little; and hence proceeds either coftivenefs or loofenefs. The former is frequently not to be accounted morbid; but, when it is, it may arife from the ftructure of the inteftines being injured, or from their being fhut up or obftructed by fpafm or otherwife, or from a deficiency of thofe humours which moiften the inteftines; or it may arife from mere debility, from a palfy of the fibres perhaps, or from a deficiency of the ufual ftimulus, of the bile, for inftance, or from too dry or flender a diet.

The confequences of long-continued coftivenefs, are firft an affection of the alimentary canal, and then of the whole body. The ftomach is difeafed, and does not digeft the aliments properly; the whole body is left deftitute of its ufual ftimulus; the blood is corrupted, perhaps from the reforption of the putrid matter into it. The circulation through the abdominal vifcera is impeded; hence frequent and irregular congeftions, varices of the veins, hemorrhoids, &c. Nay, the inteftines themfelves being overloaded, diftended and irritated by an heavy, acrid, and putrid load of aliment or other matters, are excited to new and unufual contractions, which, if they do not get the better of the obftruction, bring on tormina, colic, or an iliac paffion, inflammation and gangrene, fatal in a very fhort time.

109 Loofenefs.

Loofenefs, or diarrhœa, is a malady extremely common; being fometimes a primary difeafe, and fometimes only a fymptom or an effect of others. Sometimes it is a falutary effort of nature, fuch as the phyfician ought to imitate and bring on by art. It is alfo familiar to infants, and to people of a certain conftitution; and to them coftivenefs is very prejudicial. It may arife, in the firft place, from fomething taken into the body, or generated in the inteftines; from a fermentation and corruption of the mafs of aliments; from the bile being too abundant and acrid, or from blood or pus poured into the inteftines; from the inteftines themfelves being eroded, or deprived of their natural mucus; from the humours being driven from the furface of the body towards the inward parts, as by cold, efpecially when applied to the feet; or from a general corruption of the whole body, as in the phthifis, hectic, or putrid fever, efpecially towards the end of thefe diforders. In fevers it is fometimes falutary, or even puts an end to the difeafe altogether, or at leaft renders it milder: more frequently, however, deriving its origin from putrefcency, it is of no fervice, but rather exhaufts the ftrength of the patient. A diarrhœa likewife, almoft incurable, and often mortal in a fhort time, frequently arifes after the operation for the fiftula in ano. Some have their inteftines fo extremely weak and moveable, that from the flighteft caufe, fuch as catching cold, any violent commotion of the mind, &c. they are fubject to a violent diarrhœa. Laftly, whatever be its origin, if it hath continued for a long time, the vifcera are rendered fo weak and irritable, Diforders of the Alimentary Canal.

ritable, that the difeafe, though often removed, ftill returns from the flighteft caufes, and even fuch as are not eafily difcovered.

A diarrhœa proves very pernicious, by hindering digeftion and the nourifhment of the body; for the ftomach is commonly affected, and the aliments pafs through the inteftines fo quickly, that they can neither be properly digefted, nor are the lacteals able to abforb the chyle from them as they go along. Such a violent evacuation is alfo hurtful by exhaufting the body, and carrying off a great quantity of the nutritious matter from the blood. Neither, indeed, is it only the alimentary mafs which is thrown out fooner than it ought to be; but at the fame time, a great quantity of the fluids fecreted in the inteftines, fo that the whole body quickly partakes of the debility.

Sometimes a violent and long-continued diarrhœa rifes to fuch a height, that the aliment is difcharged with little or no alteration. Sometimes alfo, though rarely, from a fimilar caufe, or from the obftruction of the mefenteric glands, and its other paffages into the blood, the chyle itfelf is thrown out like milk along with the excrements; and this difeafe is called the 110 *fluxus cœliacus*.

Dyfentery.

A dyfentery is attended with very fevere gripes in the belly, a frequent defire of going to ftool, and vain efforts which excrete nothing befides the mucus of the inteftines mixed with a little blood; and is accompanied with exceffive debility, and frequently with putrefcency and fever. It is thought to arife from the conftriction of fome part of the inteftines, of the colon efpecially: by which means the bowels, though ever fo much irritated, can pafs nothing; neither can the difeafe be removed until the belly has been well purged by proper medicines.

111 Tenefmus.

A tenefmus is a frequent and infatiable propenfity to ftool, without being able to pafs any thing, notwithftanding the moft violent efforts. It may be occafioned by any kind of irritation, either of the rectum itfelf or of the neighbouring parts, by acrid fubftances taken into the body; by fome of the ftronger purges, efpecially aloes, which is very difficult of folution, and will pafs even to the rectum with very little alteration; by a violent and obftinate diarrhœa, dyfentery, hæmorrhoids, worms, fiftula, calculus, ulcer in the bladder, urethra, &c. It is often very pernicious, both from the exceffive uneafinefs it occafions to the patient, and from its exhaufting his ftrength, by the frequent and vain efforts bringing on a prolapfus ani, and communicating the violent irritation to the neighbouring parts, as the bladder, &c.

112 Naufea and vomiting.

A naufea and vomiting are diforders very common, and owing to almoft innumerable caufes; not only to affections of the ftomach itfelf, but alfo to affections and irritations of the remoteft parts of the body which may act upon the ftomach by fympathy. Every irritation and diftention of that vifcus therefore, a load of crude aliment, an obftruction about the pylorus, all acrid fubftances taken into it, difeafes of the liver, inteftines, kidneys, uterus, the head, the feet, the fkin, or indeed the whole body, inflammation, the ftone, king's evil, fcirrhus, apoplexy, compreffion of the brain, fracture of the fkull, vertigo, fyncope, violent pain, the gout, efpecially when repelled, fevers, paffions of the mind, difagreeable imaginations or difcourfes, frequently induce naufea and vomiting.

Thefe affections are often ferviceable by freeing the ftomach from fomething with which it was overloaded; promoting fpitting in fome cafes where the lungs are overcharged with mucus, blood, pus, or water; producing fweat, and a free and proper diftribution of blood to the furface of the body; partly, perhaps, by the great ftraining which accompanies vomiting, but rather by that wonderful fympathy which takes place between the ftomach and fkin: and hence, in many difeafes, vomiting is a moft excellent remedy. It is however in fome cafes hurtful, if too violent or too frequently repeated, partly by debilitating and making the ftomach more eafily moved; and partly by fatiguing the patient with violent ftrainings, which occafion hernias, abortions, &c. 113

Iliac paffion.

Sometimes we find the motion of the inteftines totally inverted, from the anus to the mouth; a moft dangerous diftemper, which hath obtained the name of the *iliac paffion*. It moft frequently arifes from fome obftruction in the alimentary canal hindering the defcent of the excrements, as fcirrhus, fpafm, inflammation, &c.: though the moft perfect iliac paffion takes place without any obftruction, fo that clyfters will be vomited; and even after this has continued for feveral days, the patients have at length recovered.

A flighter degree of the iliac paffion, namely the inverfion of the periftaltic motion of the duodenum, always takes place in long continued and violent vomiting, as in fea-ficknefs, or when a perfon has taken too large a dofe of an emetic; by which means a vaft quantity of bile frequently afcends into the ftomach, and is difcharged by vomiting. 114

Cholera.

An exceffive vomiting with loofenefs is called a *cholera*, when the matter difcharged has a bilious appearance. It arifes from a very great irritation of the alimentary canal without any obftruction; and is for the moft part occafioned by too great a quantity, or from an acrimony of the bile, from whence it takes its name. It may originate from feveral caufes, as too ftrong a dofe of an emetic and cathartic medicine, eating too great a quantity of fummer-fruits, &c. and is a very violent malady, often killing the patient in a few hours, unlefs proper remedies be applied in time. 115

Obftructed perfpiration.

From a fuppreffion of any of the fecretions, or a diforder of any of the fecretory organs, many mifchiefs may arife. A diminution of perfpiration produces plethora, laffitude, languor, depreffion of mind, bad digeftion, lofs of appetite, and even a general corruption of the humours from the retention of fuch a quantity of putrefcent matter.—The more fuddenly the diminution or fuppreffion of the perfpiration takes place, the fooner the mifchief is produced, and the greater it is; not only by retaining the matter which ought to be thrown out, but by repelling the humours from the furface of the body, and directing them to other parts; whence fevers, inflammations, congeftions of the blood, &c. frequently take place.

Thus fuppreffion of perfpiration may arife from many different caufes; as from cold fuddenly applied to the body when very hot; fometimes from very violent

Diſorders of Secretion.

paſſions of the mind; or from ſpaſmodic diſeaſes, as the hyſterics, &c. It may be ſuppreſſed alſo by that kind of conſtriction of the veſſels of the ſkin which is produced by various kinds of fevers, the nature of which has hitherto been but little known.

116 Exceſſive perſpiration.

Exceſſive perſpiration or ſweating is injurious by debilitating the body, relaxing the ſkin, and expoſing the patient to all the evils which ariſe from catching cold. It may even be carried to ſuch a height as to produce fainting and death; though it muſt be owned that we cannot eaſily bring examples of people having from this cauſe their blood inſpiſſated, corrupted, or being thence made liable to inflammations and fevers.

117 Suppreſſion of urine.

A ſuppreſſion of urine is ſtill more dangerous than that of perſpiration, and unleſs relieved in a ſhort time will certainly prove fatal. This diſorder, which is called *iſchuria*, may ariſe from various diſeaſes of the kidneys, ureters, bladder, urethra, &c. Thus any obſtruction or irritation of one or other of the kidneys or ureters, by a ſtone, gravel, mucus, blood, inflammations, ſpaſm, ſuppuration, ſcirrhus, ſwellings of the neighbouring parts, &c. may either prevent the urine from being ſecreted, or may give riſe to a ſcanty or depraved ſecretion, or finally may obſtruct its paſſage into the bladder after it is ſecreted.

The urine alſo, after it has entered the bladder, is there frequently ſuppreſſed, by reaſon of various diſorders to which that organ is liable, as an irritation or inflammation, ſpaſm, acrid ſubſtances injected, or ſympathy with the neighbouring parts; or by reaſon of the texture of the bladder itſelf being deſtroyed, or from a palſy, ſcirrhus, ulcer, &c. in the bladder. Or, laſtly, the urine may be retained in the bladder from a general ſtupor, as from a diſeaſe of the brain, which happens in ſome fevers, when the patient is neither ſenſible of the uſual ſtimulus, nor even of one much greater, ſo that the fibres can ſcarcely be excited to contraction by any means whatever. This, in fevers, is always a bad ſign, and ſometimes even proves fatal.

A ſuppreſſion of urine for any length of time produces an immenſe diſtenſion of the bladder, oppreſſion, uneaſineſs, and pain, not only of the part itſelf, but of the ſurrounding ones, and even of the whole body; a ſpaſm, or inſuperable conſtriction of the ſphincter; an inflammation, gangrene, or laceration of the bladder itſelf; a violent irritation of the whole habit; then a nauſea, vomiting, vertigo, general ſtupor, and an impregnation of the whole maſs of blood with a humour of an urinous nature, which at laſt being poured out into various cavities of the body, eſpecially of the head, ſoon brings on a deep ſleep, convulſions, and death.

118 Dyſuria.

From the ſame cauſes, but acting with leſs force, proceeds that diſeaſe called a *dyſuria*, when the urine paſſes with difficulty and pain, and is frequently red, black, bloody, purulent, mucous and ſandy; the reaſon of all which appearances is very much unknown.—The moſt frequent complaint, however, in

119 Strangury

making water, is where the patient has a continual and violent deſire of paſſing his urine, while at the ſame time only two or three drops can be paſſed at once, and that not without ſome pain. This is occaſioned, even in healthy people, by ſome acrid ſubſtance taken into the ſtomach; and is very common to old people, who are generally ſubject to diſorders of the kidneys and bladder. It ariſes alſo frequently from a ſtone irritating the bladder, or from an inflammation of it, or its being deprived of its mucus, or this laſt being ſomehow or other corrupted; or laſtly, from certain diſeaſes or ſome particular ſtate of the neighbouring parts, as of the uterus, vagina, urethra, proſtrate gland, &c.

120 Incontinence of urine.

Akin to the ſtrangury is an incontinence of urine, when the patient's water either comes away againſt his will, or altogether without his knowledge. This diſorder may ariſe from debility, palſy, an ulcer or wound, or any long-continued and violent irritation of the bladder, eſpecially of its ſphincter, as from a ſtone, a general palſy, or in females, difficult labour injuring the neighbouring parts.—This ſymptom occurs in a great number of diſeaſes, eſpecially in the hydrocephalus.—Sometimes the urine is expelled with violence, either by reaſon of univerſal ſpaſms, or by violent contractions of the muſcles of reſpiration, as in ſneezing, laughter, &c.

121 Urinary calculi.

Among the diſorders incident to the urine we may reckon the production of calculi, which frequently bring on the moſt excruciating and dangerous diſeaſes.—The urine, beſides the water and ſalts, contains no ſmall ſhare of the glutinous part of the blood already ſomewhat corrupted, and ſtill inclined to farther corruption. Hence the urine even of the moſt healthy people depoſits a ſediment after it has ſtood for ſome time; and though none of this ſediment be formed in an healthy body, yet if the ſmalleſt particle of foreign matter be introduced into the bladder, a cruſt ſoon gathers round it, and it is ſure to become the baſis of a ſtone, which by degrees grows to a very great ſize. It is not unlikely, alſo, that ſome unknown fault of the fluids may contribute to the production of thoſe calculi, as the ſtone is well known to be an hereditary diſeaſe, and to be born with the patient. Calculous perſons alſo are commonly ſubject to complaints of the ſtomach, eſpecially to an acidity of it; and many have received no little relief from alkaleſcent or alkaline medicines.—From the ſame cauſes may calculi be formed in the kidneys; from which proceed a horrid train of ſymptoms deſcribed in the ſubſequent part of this treatiſe.

It is now found by accurate experiments of the moſt able chemiſts, that urinary calculi do not, as was once ſuppoſed, conſiſt almoſt entirely of an earthy matter. Their principal conſtituent is a peculiar acid approaching more nearly to the phoſphoric found in the bones than to any other. But the acid of calculus being in ſome reſpects peculiar in its nature, has among modern chemiſts obtained a peculiar name, and been diſtinguiſhed by the appellation of the *lithic acid*. It is highly probable that this acid preſent in the circulating maſs, is precipitated and diſengaged by the introduction of other acids, and thus thrown off in greater quantities by the kidneys. Thus then we can underſtand the influence of acids as tending to the generation of calculus, and of alkalies as tending to prevent it.

122 Scirrhus.

The laſt diſorder here to be taken notice of is a diſorder of the glands themſelves, owing to ſome kind of obſtruction, and is one of the moſt dreadful diſeaſes incident to human nature. Hence happens a

Scirrhus. great swelling and surprising hardness, not only without pain, but sometimes even with a diminution of sensation in the part affected; and when the gland is thus affected, it is called a *scirrhus*. Sometimes it remains in this state for a long time; but sooner or later produces the most excruciating torment. By degrees it is infected with a slow and malignant suppuration, degenerating into an horrid ulcer, consuming not only the part itself, but eating away the neighbouring ones, and corrupting the whole body with the most acrid and incurable poison. This disease is called a *cancer*, of which the causes are very little known.

Versatility of the Human Constitution. Of the organs in both sexes concerned in the function of generation, and of that function as far as we yet know any thing respecting it, an account has already been given in ANATOMY; and after what has already been said of the different functions, and of the morbid affections, to which these are subjected, we may conclude our remarks on the theory of medicine, with mentioning the remarkable versatility of the human constitution; which, more than that of any other animal, is capable of accommodating itself to every climate and to all kind of diet. Hence we may conclude, that a large proportion of the diseases to which we are subjected are produced by ourselves.

PRACTICE of MEDICINE, or an Account of the principal Diseases to which the Human Body is subjected.

123 General Arrangement of Diseases. WE have already defined medicine to be the art of preventing, curing, and alleviating, these diseases to which mankind are subjected. While these affections, however, are in number almost infinite, each in its progress is subjected to almost endless varieties from differences in climate, constitution, treatment, and a variety of other particulars. Hence we may readily explain both the difficulty of distinguishing morbid affections from each other in actual practice, and the diversity of names which have been affixed to them in the writings of ancient physicians. It may readily be supposed, that in this as well as other subjects, there has been a gradual improvement from the progressive labours of industrious and ingenious men. And although much yet remains to be done in the proper arrangement and distinction of diseases, or what has been called *methodical nosology*, yet there cannot be a doubt, that during the course of the present century, this subject has received very great improvements For these, we are in the first place highly indebted to the labours of Franciscus Boissier de Sauvages, an emiment professor of medicine at Montpelier, who, following out an idea suggested by the sagacious Dr Sydenham of England, first successfully attempted to arrange diseases as botanists had done plants, into classes, orders, genera, and species. Since the publication of the *Nosologia Methodica* of Sauvages, this subject has been successfully cultivated by several ingenious men, particularly by Sir Charles Linnæus of Upsal, to whose genius for arrangement every branch of natural history, but botany in particular, has been so highly indebted; by Rudolphus Augustus Vogel, an eminent professor at Gottingen; and by John Baptist Sagar, a distinguished physician at Iglaw in Moravia: But of all the systems of arrangement yet presented to the medical world, that published by the late illustrious Dr William Cullen of Edinburgh, may justly be considered as the best. In treating, therefore, of the principal diseases to which the human body is subjected, we shall follow his plan, endeavouring to deliver the best established observations respecting the history, theory, and practice of each. And in treating of particular genera of disease, although we follow the arrangement of Dr Cullen, yet for the satisfaction of the reader, we shall point out the classes to which the same affection is referred by the other eminent writers whom we have mentioned. And on this account, it may not be improper briefly to enumerate the general classes to which each of them have referred the affections of the human body.

The classes of Sauvages are,

1. Vitia.	6. Debilitates.
2. Febres.	7. Dolores.
3. Phlegmasiæ.	8. Vesaniæ.
4. Spasmi.	9. Fluxus.
5. Anhelationes.	10. Cachexiæ.

The classes of Linnæus are,

1. Exanthematici.	7. Motorii.
2. Critici.	8. Suppressorii.
3. Phlogistici.	9. Evacuatorii.
4. Dolorosi.	10. Deformes.
5. Mentales.	11. Vitia.
6. Quietales.	

The classes of Vogel are,

1. Febres.	7. Hyperæstheses.
2. Profluvia.	8. Cachexiæ.
3. Epischeses.	9. Paranoiæ.
4. Dolores.	10. Vitia.
5. Spasmi.	11. Deformitates.
6. Adynamiæ.	

The classes of Sagar are,

1. Vitia.	8. Anhelationes.
2. Palgæ.	9. Debilitates.
3. Cachexiæ.	10. Exanthemata.
4. Dolores.	11. Phlegmasiæ.
5. Fluxus.	12. Febres.
6. Suppressiones.	13. Vesaniæ.
7. Spasmi.	

After this short view of different classifications, we shall next present to our readers a more particular account of the arrangement of Dr Cullen; which, although it can by no means be represented as free from errors or imperfections, is yet in many respects the best that has hitherto been published.

CULLEN's *Arrangement*.

CLASS I. PYREXIÆ. A frequent pulse coming on after an horror; considerable heat; many of the functions

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tions injured; the ftrength of the limbs efpecially diminifhed.

ORDER I. Febres. Pyrexia without any primary local affection, following langour, laffitude, and other fymptoms of debility.

Sect. I. *Intermittentes.* Fevers arifing from the miafma of marfhes; with an apyrexia, or at leaft a very evident remiffion; but the difeafe returns conftantly, and for the moft part with a horror or trembling There is only one paroxyfm in a day.

Genus I. Tertiana. Similar paroxyfms at an interval of about 48 hours, coming on moft commonly at mid-day. A tertian hath either;

I. An apyrexia interpofed;

1. Varying the duration of the paroxyfms.

A. The tertian whofe paroxyfms are not extended beyond 12 hours.

B. The tertian with paroxyfms extended beyond 12 hours.

2. Varying in the return of the paroxyfms.

C. The tertian returning every day with unequal paroxyfms alternately fimilar to one another.

D. The tertian returning every third day with two paroxyfms on the fame day.

E. The tertian returning every day, with two paroxyfms on every third day, and only one on the intermediate ones.

F. The tertian returning every day, with a notable remiffion interpofed between the odd and the even days, but a lefs remarkable one between the even and the odd one.

3. Varying in its fymptoms.

G. The tertian accompanied with a difpofition to fleep.

H. Accompanied with fpafms and convulfive motions.

I. Accompanied with an efflorefcence on the fkin.

K. With phlegmafia.

4. Varying in being complicated with other difeafes.

5. Varying as to its origin.

II. With the interpofition only of a remiffion between the paroxyfms.

Genus II. Quartana. Similar paroxyfms, with an interval of about 72 hours, coming on in the afternoon.

I. With the interpofition of an apyrexia.

1. Varying in the type.

A. The quartan with fingle paroxyfms, returning every fourth day, none on the other days.

B. With two paroxyfms every fourth day, and none on the other days.

C. With three paroxyfms every fourth day, and none on the intermediate days.

D. Of the four days having only the third free from fever, with fimilar paroxyfms every fourth day.

E. The quartan coming on every day, with fimilar paroxyfms every fourth day.

2. Varying in its fymptoms.

3. Varying in being complicated with other difeafes.

II. With a remiffion only between the paroxyfms.

Genus III. Quotidiana. Similar paroxyfms with an interval of about 24 hours, coming on in the morning.

I. With the interpofition of an apyrexia.

1. Varies in being folitary.

A. Univerfal.

B. Partial.

2. Complicated with other difeafes.

II. With a remiffion only between the paroxyfms.

Sect. II. *Continuæ.* Fevers without any intermiffion, and not occafioned by marfh miafmata; attended with exacerbations and remiffions, though not very remarkable.

Genus IV. Synocha. Great heat; a frequent, ftrong, and hard pulfe; high-coloured urine; the functions of the fenforium a little difturbed.

Genus V. Typhus. A contagious difeafe; the heat not greatly above the natural; the pulfe fmall, weak, and for the moft part frequent; the urine little changed; the functions of the fenforium very much difturbed, and the ftrength greatly diminifhed.

The fpecies are,

I. Typhus *petechialis.* Typhus for the moft part with petechiæ.

Varying in degree. 1. Mild typhus. 2. Malignant typhus.

II. Typhus *icterodes.* Typhus with a yellownefs of the fkin.

Genus VI. Synochus. A contagious difeafe. A fever compofed of a fynocha and typhus; in the beginning a fynocha, but towards the end a typhus.

ORDER II. Phlegmafiæ. A fynocha fever, with inflammation or topical pain, the internal function of the part being at the fame time injured; the blood covered with fize.

Genus VII. Phlogofis. Pyrexia; rednefs, heat, and painful tenfion, of fome external part.

The fpecies are,

I. Phlogofis (*phlegmone*) of a vivid red colour; a fwelling well defined, for the moft part elevated to a point, and frequently degenerating into an abfcefs, with a beating or throbbing pain.

The variations are, 1. In the form. 2. In the fituation.

II. Phlogofis (*erythema*) of a reddifh colour, vanifhing by preffure; of an unequal and creeping circumference, with fcarce any fwelling; ending in the fcaling off the cuticle, in phlyctenæ, or blifters.

The variations are, 1. In the degree of violence. 2. In the remote caufe. 3. In being complicated with other difeafes.

The confequences of a phlogofis are, an imposthume, gangrene, fphacelus.

Genus VIII. Ophthalmia. A rednefs and pain of the eye, with an inability to bear the light; for the moft part with an effufion of tears.

The fpecies and varieties of the ophthalmia are,

I Idiopathic.

1. Ophthalmia (*membranarum*), in the tunica adnata, and the membranes lying under it, or the coats of the eye.

A. Varying in the degree of the external inflammation

B. In the internal coats affected.

2. Ophthalmia (*tarfi*) of the eye-lids, with fwelling, erofion, and glutinous exfudation.

II Symptomatic.

1. From a difeafe of the eye itfelf.

2. From diseases of other parts, or of the whole body.

Genus IX. Phrenitis. Violent pyrexia; pain of the head; redness of the face and eyes; inability to endure the light or any noise; watchfulness; a fierce delirium, or typhomania.

I. Idiopathic.

II. Symptomatic.

Genus X. Cynanche. Pyrexia sometimes inclining to a typhus; difficulty of swallowing and breathing; with a sensation of narrowness in the fauces.

The species are,

I. Cynanche (*tonsillaris*) affecting the mucous membrane of the fauces, but especially the tonsils, with redness and swelling, accompanied with a synocha.

II. Cynanche (*maligna*) affecting the tonsils and mucous membrane of the fauces with swelling, redness, and mucous crusts of a whitish or ash-colour, creeping, and covering ulcers; with a typhous fever and exanthemata.

II. Cynanche (*trachealis*) attended with difficult respiration, noisy and hoarse inspiration, loud cough, without any apparent tumor in the fauces, somewhat difficult deglutition, and a synocha.

IV. Cynanche (*pharingæa*) attended with redness in the bottom of the fauces, very difficult and painful deglutition, respiration sufficiently free, and a synocha.

V. Cynanche (*parotidæa*) with great swelling of the parotids and maxillary glands appearing on the outside: the respiration and deglutition but little injured; a synocha, for the most part mild.

Diseases of this genus are symptomatic, either from external or internal causes.

Genus XI. Pneumonia. Pyrexia, with a pain in some part of the thorax, difficult respiration, and cough. The species are.

I. Peripneumony, with a pulse not always hard, but sometimes soft; an obtuse pain of the breast; the respiration always difficult; sometimes the patient cannot breathe unless in an upright posture; the face swelled, and of a livid colour; the cough for the most part moist, frequently bloody.

1. Simple idiopathic peripneumonies.

Varying in degree.

2. Idiopathic peripneumonies complicated with fever.

3. Symptomatic peripneumonies.

II. Pleurisy, with a hard pulse; for the most part attended with a pungent pain of one side, augmented chiefly during the time of inspiration; an uneasiness when lying on the side; a most painful cough, dry in the beginning of the disease, afterwards moist, and frequently bloody.

1. Simple idiopathic pleurisies.

2. Pleurisies, complicated (1.) With fever. (2.) With catarrh.

3. Symptomatic pleurisies.

4. False pleurisies.

The consequences of pleurisy are a vomica or empyema.

Genus XIII. Carditis. Pyrexia; pain about the heart; anxiety; difficulty of breathing; cough; unequal pulse; palpitation of the heart, and fainting.

I. Idiopathic.

II. Symptomatic.

Genus XIV. Peritonitis. Pyrexia; pain of the belly, exasperated by an upright posture, without the proper signs of other abdominal phlegmasiæ. If the diagnostics of the following diseases are given, they may be reckoned as so many species of this genus.

I. Peritonitis (*propria*) situated in the peritonæum, properly so called, surrounding the inside of the abdomen.

II. Peritonitis (*omentalis*) in the peritonæum extended through the omentum.

III. Peritonitis (*mesenterica*) in the peritonæum spread through the mesentery.

Genus XV. Gastritis. Pyrexia inclining to a typhus; anxiety; pain and heat of the epigastrium, augmented when any thing is taken into the stomach; an inclination to vomit, and an immediate rejection of every thing swallowed; an hickup.

I. Idiopathic.

1. From internal causes.

A. Gastritis (*phlegmonodea*) attended with acute pain and violent pyrexia.

2. From external causes.

B. Gastritis (*erysipelatosa*), with a less violent fever and pain; an erysipelatous redness appearing on the fauces.

II. Symptomatic.

Genus XVI. Enteritis. Pyrexia of a typhous nature; pungent pain of the belly, stretching and twisting round the navel; vomiting; the belly obstinately bound.

I. Idiopathic.

1. Enteritis (*phlegmonodæa*), with acute pain, violent fever, vomiting, and constipation of the belly.

2. Enteritis (*erysipelatosa*) with less acute fever and pain, without vomiting; but accompanied with a diarrhœa.

II. Symptomatic.

Genus XVII. Hepatitis. Pyrexia; tension and pain of the right hypochondrium; sometimes pungent like that of a pleurisy, but more frequently obtuse; a pain reaching to the clavicle and top of the right shoulder; a difficulty of lying on the left side; dyspnœa; dry cough, vomiting, and hickup.

Genus XVIII. Splenitis. Pyrexia; tension, heat, and swelling of the left hypochondrium, the pain increasing by pressure; without the signs of nephritis.

Genus XIX. Nephritis. Pyrexia; pain in the region of the kidney, often following the course of the ureter; frequent making of water, either thin and colourless, or very red; vomiting; stupor of the thigh; with a retraction or pain of the testicle of the same side. The species are,

I. Idiopathic. Spontaneous.

II. Symptomatic.

Genus XX. Cystitis. Pyrexia; pain and swelling of the hypogastrium; frequent and painful making of water, or ischuria; and tenesmus. The species are,

I. Those arising from internal causes.

II. Those from external causes.

Genus XXI. Hysteritis. Pyrexia; heat, tension, swelling,

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swelling, and pain of the hypogastrium; the os uteri painful when touched; vomiting.

Genus XXII. Rheumatismus. A disease arising from an external and frequently very evident cause; pyrexia; pain about the joints, frequently pursuing the course of the muscles; infesting the knees and other large joints rather than those of the feet or hands; increased by external heat.

The species are either idiopathic or symptomatic. The former varies in situation.

A. In the muscles of the loins.

B. In the muscles of the coxendix.

C. In the muscles of the breast.

Genus XXIII. Odontalgia; a rheumatism of the jaws from a caries of the teeth.

Genus XXIV. Podagra. An hereditary disease, arising without any evident external cause, but for the most part preceded by an unusual affection of the stomach; pyrexia; pain of a joint for the most part of the great toe of the foot, at least infesting chiefly the wrists and ankles; returning by intervals; and often alternated with affections of the stomach and other internal parts.

I. Podagra (*regularis*) with a pretty violent inflammation of the joints remaining for some days, and by degrees going off with swelling, itching, and desquamation of the affected part.

II. Podagra (*atonica*) with an atony of the stomach, or some other internal part; and either without the usual inflammation of the joints, or only with slight and wandering pains; and frequently alternated with dyspepsia, or other symptoms of atony.

III. Podagra (*retrograda*) with the inflammation of the joints suddenly receding, and an atony of the stomach and other parts immediately following.

IV. Podagra (*aberrans*) with the inflammation of an internal part either preceding or not, and suddenly receding; with an inflammation of the joints.

Genus XXV. Arthropuosis. Deep, obtuse, and long-continued pains of the joints or muscular parts, frequently following contusions; with either no swelling, or a moderate and diffused one; no phlogosis; pyrexia, at first gentle, afterwards hectic, and at length an imposthume.

Order III. Exanthemata. Contagious diseases; affecting a person only once in their life; beginning with fever; after a certain time appear phlogoses, for the most part small and in considerable number, and dispersed over the skin.

Genus XXVI. Erysipelas. A synocha of two or three days, for the most part attended with drowsiness, often with a delirium. In some part of the skin, most frequently the face, appears a phlogosis *erythema*. (G. VII. Sp. 2.) The species are,

I. Erysipelas (*vesiculosum*) with erythema, redness creeping, occupying a large space, and in some parts ending in large blisters.

II. Erysipelas (*phlyctænodes*), with an erythema formed of a number of papulæ, chiefly occupying the trunk of the body, ending in phlyctenæ or small blisters.

The disease is also symptomatic.

Genus XXVII. Pestis. An exceedingly contagious typhus, with the highest debility. On an uncertain day of the disease buboes and carbuncles break forth. It is various in degree, but the species are uncertain.

Genus XXVIII. Variola; a contagious synocha, with vomiting, and pain on pressing the epigastrium. On the third day begins, and on the fifth is finished, the eruption of inflammatory pustules, which suppurate in the space of eight days, and at last go off in crusts; frequently leaving depressed cicatrices or pockpits in the skin. The species are,

I. Variola (*discreta*) with few, distinct, turgid pustules, having circular bases; the fever ceasing immediately after the eruption.

II. Variola (*confluens*) with numerous, confluent, irregularly shaped pustules, flaccid, and little elevated; the fever remaining after the eruption.

Genus XXIX. Varicella. Synocha; papulæ breaking out after a short fever, similar to those of the small-pox, but hardly ever coming to suppuration; after a few days going off in small scales, but never leaving any mark.

Genus XXX. Rubeola. A contagious synocha, with sneezing, epiphora, and dry hoarse cough. On the fourth day, or a little later, break forth small, clustered, and scarce elevated papulæ; after three days going off in very small branny scales.

I. Rubeola (*vulgaris*) with very small confluent, corymbose papulæ, scarce rising above the skin.

Varying,

1. In the symptoms being more severe, and the course of the disease less regular.

2. In being accompanied with a quinsey.

3. With a putrid diathesis.

II. Rubeola (*variolodes*) with distinct papulæ, raised above the skin.

Genus XXXI. Miliaria. Synochus with anxiety, frequent sighing, fœtid sweat, and points on the skin. On an uncertain day of the disease, break out red, small, distinct papulæ, spread over the whole body as well as the face; the apices of which, after one or two days, become very small white pustules, remaining for a short time.

Genus XXXII. Scarlatina. A contagious synocha. On the fourth day of the disease the face swells a little; at the same time an universal redness occupies the skin in large spots, at length running together; after three days going off in branny scales; frequently succeeded by an anasarca. The species are,

I. Scarlatina (*simplex*), not accompanied with cynanche.

II. Scarlatina (*cynanchica*), with an ulcerous cynanche.

Genus XXXIII. Urticaria. An amphemerina fever. On the second day of the disease, red spots resembling the stinging of nettles, almost vanishing during the day, but returning in the evening with the fever, and after a few days going off altogether in very small scales.

Genus XXXIV. Pemphigus. A contagious typhus. On the first, second, or third day of the disease, blisters break out in several parts of the body, of the bigness of a bean, remaining for many days, and at last pouring out a thin ichor.

Genus XXXV. Aphtha. Synochus; the tongue somewhat swelled and of a livid colour, as well as the fauces; eschars first appearing in the fauces, but at length

length occupying the whole internal part of the mouth, of a white colour, fometimes diftinct, often running together; quickly growing again when taken off; and remaining for an uncertain time.

The fpecies are, 1. Idiophatic. 2. Symptomatic.

ORDER IV. Hæmorrhagiæ. Pyrexia, with a profufion of blood, without any external violence: the blood drawn from a vein hath the fame appearance as in phlegmafiæ.

Genus XXXVI. Epiftaxis. Pain or weight of the head, rednefs of the face; a profufion of blood from the nofe.

I Idiopathic.

Varying according to the time of life.

1. Epiftaxis of young people, with fymptoms of an arterious plethora.

2. Epiftaxis of old people, with fymptoms of a venous plethora.

II. Symptomatic.

1. From internal caufes.

2. From external caufes.

Genus XXXVII. Hæmoptyfis. Rednefs of the cheeks; a fenfation of uneafinefs, or pain, and fometimes of heat in the breaft; difficulty of breathing; tickling of the fauces; either a fevere or lefs violent cough, bringing up florid and frequently frothy blood.

The idiopathic fpecies are,

1. Hæmoptyfis (*plethorica*), without any external violence, and without being preceded by any cough or fuppreffion of any cuftomary evacuation.

2. Hæmoptyfis (*violenta*), from external violence applied.

3. Hæmoptyfis (*phthifica*), after a long-continued cough, with a leannefs and debility.

4. Hæmoptyfis (*calculofa*), in which fome calculous molecules, for the moft part of a calcareous nature, are thrown up.

5. Hæmoptyfis (*vicaria*), after the fuppreffion of a cuftomary evacuation.

Befides thefe, there are a number of fymptomatic fpecies mentioned by different authors. The confequence of an hæmoptyfis is, a

Phthifis. A wafting and debility of the body, with a cough, hectic fever, and for the moft part a purulent expectoration The fpecies are,

I. An incipient phthifis, without any expectoration of pus.

II. A confirmed phthifis, with an expectoration of pus.

Both fpecies vary, 1. As to their remote caufe. 2. As to the origin of the purulent matter.

Genus XXXVIII. Hæmorrhois. Weight and pain of the head; vertigo; pain of the loins; pain of the anus; livid painful tubercles, from which for the moft part blood flows out; which fometimes alfo drops out of the anus, without any apparent tumor. The fpecies are,

1. Hæmorrhois (*tumens*), external from marifcæ.

Varying.

A. Bloody.

B. Mucous.

2. Hæmorrhois (*procidens*), external from a *procidentia ani.*

3. Hæmorrhois (*fluens*), internal, without any fwelling, or *procidentia ani.*

4. Hæmorrhois (*cæca*), with pain and fwelling of the anus, without any profufion of blood.

Genus XXXIX. Menorrhagia. Pains of the back, belly, and loins, like thofe of child-birth; an unufually copious flux of the menfes or blood from the vagina. The fpecies are,

1. Menorrhagia (*rubra*), bloody in women neither with child nor in child-birth.

2. Menorrhagia (*abortus*), bloody in women with child.

3. Menorrhagia (*lochialis*), bloody in women after delivery.

4. Menorrhagia (*vitiorum*) bloody from fome local difeafe.

5. Menorrhagia (*alba*), ferous, without any local difeafe, in women not with child.

6. Menorrhagia (*Nabothi*), ferous in women with child.

ORDER V. Profluvia. Pyrexia, with an increafed fecretion, naturally not bloody.

Genus XL. Catarrhus. Pyrexia frequently contagious; an increafed excretion of mucus, at leaft efforts to excrete it.

The fpecies are for the moft part fymptomatic.

1. From cold.

2. From contagion

Genus XLI. Dyfenteria. Contagious pyrexia; frequent mucous or bloody ftools, while the alvine feces are for the moft part retained; gripes; tenefmus.

Varying:

1. Accompanied with worms.

2. With the excretion of fmall flefhy or febaceous bodies.

3. With an intermittent fever.

4. Without blood.

5. With a miliary fever.

CLASS II. NEUROSES. An injury of the fenfe and motion, without an idiopathic pyrexia or any local affection.

ORDER. I. Comata. A diminution of voluntary motion, with fleep, or a deprivation of the fenfes.

Genus XLII. Apoplexia. Almoft all voluntary motion diminifhed, with fleep more or lefs profound; the motion of the heart and arteries remaining.

The idiopathic fpecies are,

1. Apoplexia (*fanguinea*) with fymptoms of univerfal plethora, efpecially of the head.

2. Apoplexia (*ferofa*) with a leucophlegmatia over the whole body, efpecially in old people.

3. Apoplexia (*hydrocephalica*) coming on by degrees; affecting infants, or thofe below the age of puberty, firft with laffitude, a flight fever and pain of the head, then with flownefs of the pulfe, dilatation of the pupil of the eye, and drowfinefs.

4. Apoplexia (*atrabiliaria*) taking place in thofe of a melancholic conftitution.

5. Apoplexia (*traumatica*) from fome external injury mechanically applied to the head.

6. Apoplexia (*venenata*) from powerful fedatives taken internally or applied externally.

7. Apo-

7. Apoplexia (*mentalis*) from a passion of the mind.

8. Apoplexia (*cataleptica*) the muscles remaining contractile, by external motion of the limbs.

9. Apoplexia (*suffocata*) from some external suffocating power.

The apoplexia is frequently symptomatic.

1 Of an intermitting fever. 2 Continued fever. 3 Phlegmasia. 4 Exanthema. 5 Hysteria. 6 Epilepsy. 7 Podagra. 8 Worms. 9 Ischuria. 10 Scurvy.

Genus XLIII. Paralysis. Only some of the voluntary motions diminished, frequently with sleep.

The idiopathic species are,

1 Paralysis (*partialis*) of some particulur muscles only.

2 Paralysis (*hemiplegica*) of one side of the body.

Varying according to the constitution of the body.

a. Hemiplegia in a plethoric habit.

b In a leucophlegmatic habit

3 Parlysis *paraplegica*) of one half of the body taken transversely.

4 Paralysis (*venenata*) from sedative powers applied either internally or externally.

A symptom either of an Asthenia or Palsy is,

Tremor; an alternate motion of a limb by frequent strokes and intervals.

The species are, 1 Asthenic. 2 Paralytic. 3 Convulsive.

Order II. Adynamiæ. A diminution of the involuntary motions whether vital or natural.

Genus XLIV. Syncope; a diminution, or even a total stoppage, of the motion of the heart for a little.

I. Idiopathic.

1 Syncope (*cardiaca*), returning frequently without any manifest cause, with violent palpitations of the heart during the intervals.—From a fault of the heart or neighbouring vessels.

2. Syncope (*occasionalis*) arising from some evident cause.—From an affection of the whole system.

II. Symptomatic; or symptoms of diseases either of the whole system, or of other parts besides the heart.

Genus XLV. Dyspepsia. Anorexia, nausea, vomiting, inflation, belching, rumination, cardialgia, gastrodynia, more or fewer of those symptoms at least concurring; for the most part with a constipation of the belly, and without any other disease either of the stomach itself or of other parts.

I. Idiopathic.

II. Symptomatic.

1. From a disease of the stomach itself.

2. From a disease of other parts, or of the whole body.

Genus XLVI. Hypochondriasis. Dyspepsia, with languor, sadness and fear without any adequate causes, in a melancholy temperament.

Genus XLVII. Chlorosis. Dyspepsia, or a desire of something not used as food; a pale or discoloured complexion; the veins not well filled; a soft tumor of the whole body; asthenia; palpitation; suppression of the menses

Order III. Spasmi. Irregular motions of the muscles or muscular fibres.

Sect. I. *In the animal functions.*

Genus XLVIII. Tetanus;—a spastic rigidity of almost the whole body.

Varying according to the remote cause, as it arises either from something internal, from cold, or from a wound. It varies likewise from whatever cause it may arise, according to the part of the body affected.

Genus XLIX. Trismus. A spastic rigidity of the lower jaw.—The species are,

1. Trismus (*nascentium*), seizing infants under two months old.

2. Trismus (*traumaticus*), seizing people of all ages either from a wound or cold.

Genus L. Convulsio.—An irregular clonic contraction of the muscles without sleep.

I. Idiopathic.

II. Symptomatic.

Genus LI. Chorea, attacking those who have not yet arrived at puberty, most commonly within the 10th or 14th year, with convulsive motions for the most part of one side in attempting the voluntary motion of the hands and arms, resembling the gesticulations of mountebanks; in walking, rather dragging one of their feet after them than lifting it.

Genus LII. Raphania. A spastic contraction of the joints, with a convulsive agitation, and most violent periodical pain.

Genus LIII. Epilepsia. A convulsion of the muscles, with sleep.

The idiopathic species are,

1. Epilepsia (*cerebralis*), suddenly attacking without any manifest cause, without any sense of uneasiness preceding, excepting perhaps a slight vertigo or scotomia.

2. Epilepsia (*sympathica*), without any manifest cause, but preceded by the sensation of a kind of air rising from a certain part of the body towards the head.

3. Epilepsia (*occasionalis*), arising from a manifest irritation, and ceasing on the removal of that irritation.

Varying according to the difference of the irritating matter. And thus it may arise,

From injuries of the head; pain; worms; poison; from the repulsion of the itch, or an effusion of any other acrid humour; from crudities in the stomach; from passions of the mind; from an immoderate hemorrhagy; or from debility.

Sect. II. *In the vital functions.*

In the action of the heart.

Genus LIV. Palpitatio. A violent and irregular motion of the heart.

In the action of the lungs.

Genus LV. Asthma. A difficulty of breathing returning by intervals, with a sense of straitness in the breast, and a noisy respiration with hissing. In the beginning of the paroxysm there is either no cough at all, or coughing is difficult; but towards the end the cough becomes free, frequently with a copious spitting of mucus.—The idiopathic species are,

1. Asthma (*spontaneum*), without any manifest cause or other concomitant disease.

2. Asthma (*exanthematicum*), from the repulsion of the itch or other acrid effusion.

3. Asthma (*plethoricum*), from the suppression of some

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some customary sanguineous evacuation, or from a spontaneous plethora.

Genus LVI. Dyspnœa. A continual difficulty of breathing, without any sense of straitness, but rather of fullness and infarction in the breast; a frequent cough throughout the whole course of the disease.

The idiopathic species are,

1. Dyspnœa (*catarrhalis*), with a frequent cough, bringing up plenty of viscid mucus.

2. Dyspnœa (*sicca*), with a cough for the most part dry.

3. Dyspnœa (*aërea*), increased by the least change of weather.

4. Dyspnœa (*terrea*), bringing up with the cough an earthy or calculous matter.

5. Dyspnœa (*aquosa*), with scanty urine and œdematous feet; without any fluctuation in the breast, or other signs of an hydrothorax.

6. Dyspnœa (*pinquedinosa*), in very fat people

7. Dyspnœa (*thoracica*), from an injury done to the parts surrounding the thorax, or from some bad conformation of them.

8. Dyspnœa (*extrinseca*), from evident external causes.

The symptomatic species of dyspnœa are symptoms,

1. Of diseases of the heart or large vessels.

2. Of a swelling in the abdomen.

3. Of various diseases.

Genus LVII. Pertussis. A contagious disease; convulsive strangulating cough reiterated with noisy inspiration; frequent vomiting.

Sect. III. *In the natural functions.*

Genus LVIII. Pyrosis. A burning pain in the epigastrium, with plenty of aqueous humour, for the most part insipid, but sometimes acrid, belched up.

Genus LIX. Colica. Pain of the belly, especially twisting round the navel; vomiting; a constipation.

The idiopathic species are,

1. Colica (*spasmodica*), with retraction of the navel, and spasms of the abdominal muscles.

Varying, by reason of some symptoms superadded. Hence,

a, Colica, with vomiting of excrements, or of matters injected by the anus.

b, Colica, with inflammation supervening.

2. Colica (*pictonum*), preceded by a sense of weight or uneasiness in the belly, especially about the navel; then comes on the colic pain, at first slight and interrupted, chiefly augmented after meals: at length more severe and almost continual, with pains of the arms and back, at last ending in a palsy.

Varying according to the nature of the remote cause; and hence,

a, From metallic poison.

b, From acids taken inwardly.

c, From cold.

d, From a contusion of the back.

3. Colica (*stercorea*), in people subject to costiveness.

4. Colica (*accidentalis*), from acrid matter taken inwardly.

5. Colica (*meconialis*), in new-born children from a retention of the meconium.

6. Colic (*callosa*), with a sensation of stricture in some part of the intestines, and frequently of a collection of flatus with some pain before the constricted part; which flatus also passing through the part where the stricture is felt, gradually vanishes; the belly slow, and at last passing only a few liquid fæces.

7. Colica (*calculosa*), with a fixed hardness in some part of the abdomen, and calculi sometimes passing by the anus.

Genus LX. Cholera. A vomiting of bilious matter, and likewise a frequent excretion of the same by stool; anxiety; gripes; spasms in the calves of the legs.

I. Idiopathic.

1. Cholera (*spontanea*), arising in a warm season, without any manifest cause.

2. Cholera (*accidentalis*), from acrid matters taken inwardly.

II. Symptomatic.

Genus LXI. Diarrhœa. Frequent stools; the disease not infectious; no primary pyrexia.

I. Idiopathic.

1. Diarrhœa (*crapulosa*), in which the excrements are voided in greater quantity than naturally.

2. Diarrhœa (*biliosa*), in which yellow feces are voided in great quantity.

3. Diarrhœa (*mucosa*), in which either from acrid substances taken inwardly, or from cold, especially applied to the feet, a great quantity of mucus is voided.

4. Diarrhœa (*cæliaca*), in which a milky humour of the nature of chyle is passed.

5. Diarrhœa (*lienteria*), in which the aliments are discharged with little alteration soon after eating.

6. Diarrhœa (*hepatirrhœa*), in which a bloody serous matter is discharged without pain.

II. Symptomatic.

Genus LXII. Diabetes. A chronical profusion of urine, for the most part preternatural, and in immoderate quantity.

I. Idiopathic.

1. Diabetes (*mellitus*), with urine of the smell, colour, and taste of honey.

2. Diabetes (*insipidus*), with limpid, but not sweet, urine.

II. Symptomatic.

Genus LXIII. Hysteria. Rumbling of the bowels; a sensation as of a globe turning itself in the belly, ascending to the stomach and fauces, and there threatening suffocation; sleep; convulsions; a great quantity of limpid urine; the mind involuntarily fickle and mutable.

The following are by Sauvages reckoned distinct idiopathic species; but, by Dr Cullen, only varieties of the same species.

A, From a retention of the menses.

B, From a menorrhagia cruenta.

C, From a menorrhagia serosa, or fluor albus.

D, From an obstruction of the viscera.

E, From a fault of the stomach.

F, From too great salacity.

Genus LXIV. Hydrophobia. A dislike and horror at any kind of drink, as occasioning a convulsion of the pharynx; induced, for the most part, by the bite of a mad animal. The species are,

1. Hydro-

I. Hydrophobia (*rabiosa*), with a desire of biting the bystanders, occasioned by the bite of a mad animal.

II. Hydrophobia (*simplex*), without madness, or any desire of biting.

Order IV. Vesaniæ. Disorders of the judgment, without any pyrexia or coma.

Genus LXV. Amentia; an imbecility of judgement, by which people either do not perceive, or do not remember, the relations of things. The species are,

I. Amentia (*congenita*), continuing from a person's birth.

II. Amentia (*senilis*), from the diminution of the perceptions and memory through extreme old age.

III Amentia (*acquisita*), occurring in people formerly of a sound mind, from evident external causes.

Genus LXVI. Melancholia; a partial madness, without dyspepsia.

Varying according to the different subjects concerning which the person raves; and thus it is,

1. With an imagination in the patient concerning his body being in a dangerous condition, from slight causes; or that his affairs are in a desperate state.

2. With an imagination concerning a prosperous state of affairs.

3 With violent love, without satyriasis or nymphomania.

4. With a superstitious fear of a future state.

5. With an aversion from motion and all the offices of life.

6. With restlessness, and an impatience of any situation whatever.

7. With a weariness of life.

8. With a deception concerning the nature of the patient's species.

Dr Cullen thinks that there is no such disease as that called *dæmonomania*, and that the diseases mentioned by Sauvages under that title are either,

1. Species of melancholy or mania; or

2. Of some disease by the spectators falsely ascribed to the influence of an evil spirit; or

3. Of a disease entirely feigned; or

4. Of a disease partly true and partly feigned.

Genus LXVII. Mania; universal madness.

1. Mania (*mentalis*), arising entirely from passions of the mind.

2. Mania (*corporea*), from an evident disease of the body.

Varying according to the different disease of the body.

3. Mania (*obscura*), without any passion of mind or evident disease of the body preceding.

The symptomatic species of mania are,

1. Paraphrosyne from poisons.

2. Paraphrosyne from passion.

3 Paraphrosyne febrilis.

Genus LXVIII. Oneirodynia. A violent and troublesome imagination in time of sleep.

1. Oneirodynia (*activa*), exciting to walking and various motions.

2. Oneirodynia (*gravans*), from a sense of some weight incumbent, and pressing on the breast especially.

CLASS III. Cachexiæ; a depraved habit of the whole or greatest part of the body, without primary pyrexia or neurosis.

Order I. Marcores; a wasting of the whole body.

Genus LXIX. Tabes. Leanness, asthenia, hectic pyrexia. The species are,

1. Tabes (*purulenta*), from an external or internal ulcer, or from a vomica.

Varying in its situation: hence,

2. Tabes (*scrophulosa*), in scrophulous constitutions

3. Tabes (*venenata*), from poison taken inwardly.

Genus LXX. Atrophia. Leanness and asthenia, without hectic pyrexia. The species are,

1. Atrophia (*inanitorum*), from too great evacuation.

2. Atrophia (*famelicorum*), from a deficiency of nourishment.

3. Atrophia (*cacochymica*), from corrupted nourishment.

4. Atrophia (*debilium*), from the function of nutrition being depraved, without any extraordinary evacuation or cacochymia having preceded.

Order II. Intumescentiæ. An external tumor of the whole or greatest part of the body.

Sect. I. *Adiposæ.*

Genus LXXI. Polysarcia; a troublesome swelling of the body from fat.

Sect. II. *Flatuosæ.*

Genus LXXII. Pneumatosis; a tense elastic swelling of the body, crackling under the hand. The species are,

1. Pneumatosis (*spontanea*), without any manifest cause.

2. Pneumatosis (*traumatica*), from a wound in the breast.

3 Pneumatosis (*venenata*), from poison injected or applied.

4. Pneumatosis (*hysterica*), with hysteria.

Genus LXXIII. Tympanites; a tense, elastic, sonorous swelling of the abdomen; costiveness; a decay of the other parts The species are,

1. Tympanites (*intestinalis*), with a tumor of the abdomen frequently unequal, and with a frequent evacuation of air relieving the tension and pain.

2. Tympanites (*abdominalis*), with a more evident noise, a more equable tumor, and a less frequent emission of flatus, which also gives less relief.

Genus LXXIV. Physometra; a slight elastic swelling in the epigastrium, having the figure and situation of the uterus.

Sect. III. *Aquosæ or Hydropes.*

Genus LXXV. Anasarca. A soft, inelastic swelling of the whole body, or some part of it. The species are,

1. Anasarca (*serosa*), from a retention of serum on account of the suppression of the usual evacuations, or from an increase of the serum on account of too great a quantity of water taken inwardly.

2. Anasarca (*oppilata*), from a compression of the veins.

3 Anasarca (*exanthematica*), arising after exanthemata, especially after the erysipelas.

4. Anafarca (*anæmia*), from the thinnefs of the blood produced by hemorrhagy.

5. Anafarca (*debilium*), in weak people after long difeafes, or from other caufes.

Genus LXXVI. Hydrocephalus. A foft inelaftic fwelling of the head, with the futures of the cranium opened.

Genus LXXVII. Hydrorachitis. A foft, flender tumor above the vertebræ of the loins; the vertebræ gaping from each other.

Genus LXXVIII. Hydrothorax. Dyfpnœa; palenefs of the face; œdematous fwellings of the feet; fcanty urine; lying down difficult; a fudden and fpontaneous waking out of fleep, with palpitation; water fluctuating in the breaft

Genus LXXIX Afcites A tenfe, fcarce elaftic, but fluctuating fwelling of the abdomen. The fpecies are,

1. Afcites (*abdominalis*), with an equal fwelling of the whole abdomen, and with a fluctuation fufficiently evident.

Varying according to the caufe

A, From an obftruction of the vifcera.

B, From debility

C, From a thinnefs of the blood

2 Afcites (*faccatus*), with a fwelling of the abdomen, in the beginning at leaft, partial, and with a lefs evident fluctuation

Genus LXXX Hydrometra. A fwelling of the hypogaftrium in women, gradually increafing, keeping the fhape of the uterus, yielding to preffure, and fluctuating; without ifchuria or pregnancy

Genus LXXXI. Hydrocele A fwelling of the fcrotum, not painful; increafing by degrees, foft, fluctuating, and pellucid.

Sect. IV *Solidæ*.

Genus LXXXII. Phyfconia. A fwelling chiefly occupying a certain part of the abdomen, gradually increafing, and neither fonorous nor fluctuating. The fpecies are,

Phyfconia hepatica.
Phyfconia fplenica.
Phyfconia renalis.
Phyfconia uterina.
Phyfconia ab ovario.
Phyfconia mefenterica.
Phyfconia inteftinalis.
Phyfconia omentalis.
Phyfconia polyfplachna.
Phyfconia vifceralis.
Phyfconia externa lupialis.
Phyfconia externa fcirrhodea.
Phyfconia externa hydatidofa.
Phyfconia ab adipe fubcutaneo.
Phyfconia ab excrefcentia.

Genus LXXXIII. Rachitis. A large head, fwelling moft in the forepart, the ribs depreffed; abdomen fwelled, with a decay of the other parts.

Varying,

1. Simple, without any other difeafe.
2. Joined with other difeafes.

Order III. Impetigines. Cachexies chiefly deforming the fkin and external parts of the body.

Genus LXXXIV. Scrophula. Swellings of the conglobate glands, efpecially in the neck; fwelling of the upper lip and fupport of the nofe; the face florid, fkin thin, abdomen fwelled. The fpecies are,

1. Scrophula (*vulgaris*), fimple, external, and permanent.

2. Scrophula (*mefenterica*), fimple, internal, with palenefs of the face, want of appetite, fwelling of the abdomen, and unufual fetor of the excrements.

3. Scrophula (*fugax*), moft fimple, appearing only about the neck; for the moft part proceeding from the reforption of the matter of ulcers in the head.

4. Scrophula (*Americana*). joined with the yaws.

Genus LXXXV. Syphilis. A contagious difeafe, after impure venery, and a diforder of the genitals; ulcers of the tonfils; of the fkin, efpecially about the margin of the hair; corymbofe papulæ, ending in crufts and crufty ulcers; pains of the bones; exoftofes.

Genus LXXXVI. Scorbutus; in cold countries, attacking after putrefcent diet, efpecially fuch as is falt and of the animal-kind, where no fupply of frefh vegetables is to be had; afthenia; ftomacace; fpots of different colours on the fkin, for the moft part livid, and appearing chiefly among the roots of the hair.

Varying in degree.

a, Scorbutus incipiens.
b, Scorbutus crefcens.
c, Scorbutus inveteratus.

Varying alfo in fymptoms.

d, Scorbutus lividus.
e, Scorbutus petechialis.
f, Scorbutus pallidus.
g, Scorbutus ruber.
h, Scorbutus calidus.

Genus LXXXVII. Elephantiafis; a contagious difeafe; thick, wrinkled, rough, unctuous fkin, deftitute of hairs, anæfthefia in the extremities, the face deformed with pimples, the voice hoarfe and nafal.

Genus LXXXVIII. Lepra; the fkin rough, with white, branny, and chopped efchars, fometimes moift beneath, with itching.

Genus LXXXIX. Frambœfia; fwellings refembling fungi, or the fruit of the mulberry or rafpberry, growing on various parts of the fkin.

Genus XC. Trichoma; a contagious difeafe; the hairs thicker than ufual, and twifted into inextricable knots and cords.

Genus XCI. Icterus; yellownefs of the fkin and eyes; white fæces; urine of a dark red, tinging what is put into it of a clay colour.

The idiopathic fpecies are,

1. Icterus (*calculofus*), with acute pain in the epigaftric region, increafing after meals; biliary concretions voided by ftool.

2. Icterus (*fpafmodicus*), without pain, after fpafmodic difeafes and paffions of the mind.

3. Icterus (*hepaticus*), without pain, after difeafes of the liver.

4. Icterus (*gravidarum*), arifing during the time of pregnancy, and going off after delivery.

5. Icterus (*infantum*), coming on in infants a few days after birth.

CLASS

CLASS IV. Locales. An affection of some part, but not of the whole body.

Order I. Dysethesiæ. The senses depraved or destroyed, from a disease of the external organs.

Genus XCII. Caligo. The sight impaired or totally destroyed, on account of some opaque substance interposed between the objects and the retina, inherent in the eye itself or the eye-lids. The species are,

1. Caligo *(lentis)*, occasioned by an opaque spot behind the pupil.

2. Caligo *(corneæ)*, from an opacity of the cornea.

3. Caligo *(pupillæ)*, from an obstruction of the pupil.

Varying according to the different causes from which it proceeds.

4. Caligo *(humorum)*, from a disease or defect of the aqueous humour.

Varying according to the different state of the humour.

5. Caligo *(palpebrarum)*, from a disease inherent in the eye-lids.

Varying according to the nature of the disease in the eye-lids.

Genus XCIII. Amaurosis. The sight diminished, or totally abolished, without any evident disease of the eye; the pupil for the most part remaining dilated and immoveable. The species are,

1. Amaurosis (*compressionis*), after the causes and attended with the symptoms of congestion in the brain.

Varying according to the nature of the remote cause.

2. Amaurosis *(atonica)*, after the causes and accompanied with symptoms of debility.

3. Amaurosis (*spasmodica*), after the causes and with the signs of spasm.

4. Amaurosis (*venenata*), from poison taken into the body or applied outwardly to it.

Genus XCIV. Dysopia. A depravation of the sight, so that objects cannot be distinctly perceived, except at a certain distance, and in a certain situation. The species are,

1. Dysopia (*tenebrarum*), in which objects are not seen unless they be placed in a strong light.

2. Dysopia *(luminis)*, in which objects are not distinctly seen unless by a weak light.

3. Dysopia (*dissitorum*), in which distant objects are not perceived.

4 Dysopia (*proximorum*), in which the nearest objects are not perceived.

5. Dysopia (*lateralis*), in which objects are not perceived unless placed in an oblique posture.

Genus XCV. Pseudoblepsis; when the sight is diseased in such a manner that the person imagines he sees things which really do not exist, or sees things which do exist after some other manner than they really are. The species are,

1. Pseudoblepsis (*imaginaria*), in which the person imagines he sees things which really do not exist.

Varying according to the nature of the imagination.

2. Pseudoblepsis (*mutans*), in which objects really existing appear somehow changed.

Varying according to the change perceived in the objects, and according to the remote cause.

Genus XCVI. Dysecœa. A diminution or total abolition of the sense of hearing. The species are,

1. Dysecœa *(organica)*, from a disease in the organs transmitting sounds to the internal ear.

Varying according to the nature of the disease and of the part affected.

2. Dysecœa *(atonica)*, without any evident disease of the organs transmitting the sounds.

Varying according to the nature of the cause.

Genus XCVII. Paracusis; a depravation of the hearing. The species are,

1. Paracusis *(imperfecta)*, in which though sounds coming from external objects are heard, yet it is neither distinctly nor in the usual manner.

Varying,

a, With a dulness of hearing.

b, With an hearing too acute and sensible.

c, When a single external sound is doubled by some internal causes.

d, When the sounds which a person desires to hear are not perceived, unless some other violent sound is raised at the same time.

2. Paracusis *(imaginaria)*, in which sounds not existing externally are excited from internal causes.

Varying according to the nature of the sound perceived, and according to the nature of the remote cause.

Genus XCVIII. Anosmia; a diminution or abolition of the sense of smell. The species are,

1. Anosmia *(organica)*, from a disease in the membrane lining the internal parts of the nostrils.

Varying according to the nature of the disease.

2. Anosmia *(atonica)*, without any evident disease of the membrane of the nose.

Genus XCIX. Agheustia; a diminution or abolition of the sense of taste.

1. Agheustia *(organica)*, from a disease in the membrane of the tongue, keeping off from the nerves those substances which ought to produce taste.

2. Agheustia *(atonica)*, without any evident disease of the tongue.

Genus C. Anæsthesia; a diminution or abolition of the sense of feeling The species from Sauvages, adopted by Dr Cullen, are,

1. Anæsthesia a spina bifida.
2. Anæsthesia plethorica.
3. Anæsthesia nascentium.
4. Anæsthesia melancholica.

Order II. Dysorexia; error or defect of appetite.

Sect. I. Appetitus erronei.

Genus CI Bulimia; a desire for food in greater quantities than can be digested.

The idiopathic species are,

1. Bulimia *(helluonum)*, an unusual appetite for food, without any disease of the stomach.

2. Bulimia *(syncopalis)*, a frequent desire of meat, on account of a sensation of hunger threatening syncope.

3 Bulimia *(emetica)*, an appetite for a great quantity of meat, which is thrown up immediately after it is taken.

Genus CII. Polydipsia; an appetite for an unusual quantity of drink.

The polydipsia is almost always symptomatic, and varies

General Arrangement of Diseases.

varies only according to the nature of the disease which accompanies it.

Genus CIII. Pica; a desire of swallowing substances not used as food.

Genus CIV. Satyriasis; an unbounded desire of venery in men. The species are,

1. Satyriasis (*juvenilis*), an unbounded desire of venery, the body at the same time being little disordered.

2. Satyriasis (*furens*), a vehement desire of venery, with a great disorder of the body at the same time.

Genus CV. Nymphomania; an unbounded desire of venery in women.

Varying in degree.

Genus CVI. Nostalgia; a violent desire in those who are absent from their country of revisiting it.

1. Nostalgia (*simplex*), without any other disease.

2. Nostalgia (*complicata*), accompanied with other diseases.

Sect. II. Appetitus deficientes.

Genus CVII. Anorexia. Want of appetite for food. Always symptomatic.

1. Anorexia (*humoralis*), from some humour loading the stomach.

2. Anorexia (*atonica*), from the tone of the fibres of the stomach being lost.

Genus CVIII. Adipsia; a want of thirst. Always a symptom of some disease affecting the sensorium commune.

Genus CIX. Anaphrodisia; want of desire for, or impotence to, venery.

The true species are,

1. Anaphrodisia paralytica.

2. Anaphrodisia gonorrhoica.

The false ones are,

1. Anaphrodisia a mariscis.

2. Anaphrodisia ab urethræ vitio.

Order III. Dyscinesiæ. An impediment, or depravation of motion from a disorder of the organs.

Genus CX. Aphonia; a total suppression of voice without coma or syncope. The species are,

1. Aphonia (*gutturalis*), from the fauces or glottis being swelled.

2. Aphonia (*trachealis*), from a compression of the trachea.

3. Aphonia (*atonica*), from the nerves of the larynx being cut.

Genus CXI. Mutitas; a want of power to pronounce words. The species are,

1. Mutitas (*organica*), from the tongue being cut out or destroyed.

2. Mutitas (*atonica*), from the injuries done to the nerves of the tongue.

3. Mutitas (*surdorum*), from people being born deaf, or the hearing being destroyed during childhood.

Genus CXII. Paraphonia; a depraved sound of the voice. The species are,

1. Paraphonia (*puberum*), in which, about the time of puberty, the voice from being acute and sweet, becomes more grave and harsh.

2. Paraphonia (*rauca*), in which, by reason of the dryness or flaccid tumor of the fauces, the voice becomes rough and hoarse.

3. Paraphonia (*resonans*), in which, by reason of an obstruction in the nostrils, the voice becomes hoarse, with a sound hissing through the nostrils.

4. Paraphonia (*palatina*), in which, on account of a defect or division of the uvula, for the most part with an hare-lip, the voice becomes obscure, hoarse, and unpleasant.

5. Paraphonia (*clangens*), in which the voice is changed to one acute, shrill, and small.

6. Paraphonia (*comatosa*), in which, from a relaxation of the velum palati and glottis, a sound is produced during inspiration.

Genus CXIII. Psellismus; a defect in the articulation of words. The species are,

1. Psellismus (*hæsitans*), in which the words, especially the first ones of a discourse, are not easily pronounced, and not without a frequent repetition of the first syllable.

2. Psellismus (*ringens*), in which the sound of the letter R is always aspirated, and, as it were, doubled.

3. Psellismus (*lallans*), in which the sound of the letter L becomes more liquid, or is pronounced instead of R.

4. Psellismus (*emolliens*), in which the hard letters are changed into the softer ones, and thus the letter S is much used.

5. Psellismus (*balbutiens*), in which, by reason of the tongue being large, or swelled, the labial letters are better heard, and often pronounced instead of others.

6. Psellismus (*acheilos*), in which the labial letters cannot be pronounced at all, or with difficulty.

7. Psellismus (*logostomatum*), in which, on account of the division of the palate, the guttural letters are less perfectly pronounced.

Genus CXIV. Strabismus; the optic axes of the eyes not converging. The species are,

1. Strabismus (*habitualis*), from a bad custom of using only one eye.

2. Strabismus (*commodus*), from the greater debility or mobility of one eye above the other; so that both eyes cannot be conveniently used.

3. Strabismus (*necessarius*), from a change in the situation or shape of the parts of the eye.

Genus CXV. Contractura; a long-continued and rigid contraction of one or more limbs. The species are,

1. Contractura (*primaria*), from the muscles becoming contracted and rigid.

a, From the muscles becoming rigid by inflammation.

b, From muscles becoming rigid by spasm.

c, From muscles contracted by reason of their antagonists having become paralytic.

d, From muscles contracted by an irritating acrimony.

2. Contractura (*articularis*), from stiff joints.]

Order IV. Apocenoses. A flux either of blood or some other humour flowing more plentifully than usual, without pyrexia, or an increased impulse of fluids.

Genus CXVI. Profusio; a flux of blood.

Genus CXVII. Ephidrosis; a preternatural evacuation of sweat.

General Arrangement of Diseases.

Symptomatic ephidroses vary according to the nature of the diseases which they accompany, the different nature of the sweat itself, and sometimes the different parts of the body which sweats most.

Genus CXVIII. Epiphora; a flux of the lacrymal humour.

Genus CXIX. Ptyalismus; a flux of saliva.

Genus CXX. Enuresis; an involuntary flux of urine without pain. The species are,

1. Enuresis (*atonica*), after diseases injuring the sphincter of the bladder.

2. Enuresis (*irritata*), from a compression or irritation of the bladder.

Genus CXXI. Gonorrhœa; a preternatural flux of humour from the urethra in men, with or without a desire of venery. The species are,

1. Gonorrhœa (*pura*), in which, without any impure venery having preceded, a humour resembling pus, without disuria or propensity to venery, flows from the urethra.

2. Gonorrhœa (*impura*), in which, after impure venery, an humour like pus flows from the urethra with dysuria. The consequence of this is,

Gonorrhœa (*mucosa*), in which, after an impure gonorrhœa, a mucous humour flows from the urethra with little or no dysuria.

3. Gonorrhœa (*laxorum*), in which an humour for the most part pellucid, without any erection of the penis, but with a propensity to venery, flows from the urethra while the person is awake.

4. Gonorrhœa (*dormientium*), in which the seminal liquor is thrown out, with erection and desire of venery, in those who are asleep and have lascivious dreams.

Order V. Epischeses; suppressions of evacuations.

Genus CXXII. Obstipatio; the stools either suppressed, or slower than usual. The species are,

1. Obstipatio (*debilium*), in lax, weak, and for the most part dyspeptic persons.

2. Obstipatio (*rigidorum*), in people whose fibres are rigid, and frequently of an hypochondriac disposition.

3. Obstipatio (*obstructorum*), with symptoms of the colica 1st, 2d, 4th, and 7th, abovementioned.

Genus CXXIII. Ischuria; an absolute suppression of urine. The species are,

1. Ischuria (*renalis*), coming after a disease of the kidneys, with pain, or troublesome sense of weight in the region of the kidneys, and without any swelling of the hypogastrium, or desire of making water.

2. Ischuria (*ureterica*), coming after a disease of the kidneys, with a sense of pain or uneasiness in some part of the ureter, and without any tumor of the hypogastrium, or desire of making water.

3. Ischuria (*vesicalis*), with a swelling of the hypogastrium, pain at the neck of the bladder, and a frequent stimulus to make water.

4. Ischuria (*urethralis*), with a swelling of the hypogastrium, frequent stimulus to make water, and pain in some part of the urethra.

All these species are subdivided into many varieties, according to their different causes.

Genus CXXIV. Dysuria; a painful, and somehow impeded emission of urine. The species are,

1. Dysuria (*ardens*), with heat of water, without any manifest disorder of the bladder.

2. Dysuria (*spasmodica*), from a spasm communicated from the other parts to the bladder.

3. Dysuria (*compressionis*), from the neighbouring parts pressing upon the bladder.

4. Dysuria (*phlogistica*), from an inflammation of the neighbouring parts.

5. Dysuria (*irritata*), with signs of a stone in the bladder.

6. Dysuria (*mucosa*), with a copious excretion of mucus.

Genus CXXV. Dyspermatismus; a flow, impeded, and insufficient emission of semen in the venereal act. The species are,

1. Dyspermatismus (*urethralis*), from diseases of the urethra.

2. Dyspermatismus (*nodosus*), from knots on the cavernous bodies.

3. Dyspermatismus (*præputialis*), from too narrow an orifice of the prepuce.

4. Dyspermatismus (*mucosus*), from mucus infarcting the urethra.

5. Dyspermatismus (*hypertonicus*), from too strong an erection of the penis.

6. Dyspermatismus (*epilepticus*), from a spasmodic epilepsy happening during the time of coition.

7. Dyspermatismus (*apractodes*), from an imbecility of the parts of generation.

8. Dyspermatismus (*refluus*), in which there is no emission of semen, because it returns from the urethra into the bladder.

Genus CXXVI. Amenorrhœa. The menses either flowing more sparingly than usual, or not at all, at their usual time, without pregnancy. The species are,

1. Amenorrhœa (*emansionis*), in those arrived at puberty, in whom, after the usual time, the menses have not yet made their appearance, and many different morbid affections have taken place.

2. Amenorrhœa (*suppressionis*) in adults, in whom the menses which had already begun to flow are suppressed.

3. Amenorrhœa (*difficilis*), in which the menses flow sparingly, and with difficulty.

Order VI. Tumores; an increased magnitude of any part without phlogosis.

Genus CXXVII. Aneurisma; a soft tumor, with pulsation, above an artery.

Genus CXXVIII. Varix; a soft tumor, without pulsation, above a vein.

Genus CXXIX. Ecchymoma; a diffused, and scarce eminent, livid tumor.

Genus CXXX. Scirrhus; an hard tumor of some part, generally of a gland, without pain, and difficultly brought to suppuration.

Genus CXXXI. Cancer. A painful tumor of a scirrhous nature, and degenerating into an ill-conditioned ulcer.

Genus CXXXII. Bubo; a suppurating tumor of a conglobate gland.

Genus CXXXIII. Sarcoma; a soft swelling, without pain.

Genus CXXXIV. Verruca; a harder scabrous swelling.

Genus CXXXV. Clavus; a hard, lamellated thickness of the skin.

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Genus CXXXVI. Lupia. A moveable, soft tumour below the skin, without pain.

Genus CXXXVII. Ganglion. An harder moveable swelling, adhering to a tendon.

Genus CXXXVIII. Hydatis; a cuticular vesicle filled with aqueous humour.

Genus CXXXIX. Hydarthrus; a most painful swelling of the joints, chiefly of the knee, at first scarce elevated, of the same colour with the skin, diminishing the mobility.

Genus CXL. Exostosis; a hard tumor adhering to a bone.

Order VII. Ectopiæ; tumors occasioned by the removal of some part out of its proper situation.

Genus CXLI. Hernia; an ectopia of a soft part as yet covered with the skin and other integuments.

Genus CXLII. Prolapsus; a bare ectopia of some soft part.

Genus CXLIII. Luxatio; the removal of a bone from its place in the joints.

Order VIII. Dialyses. A solution of continuity; manifest to the sight or touch.

Genus CXLIV. Vulnus; a recent and bloody solution of the unity of some soft part by the motion of some hard body.

Genus CXLV. Ulcus. A purulent or ichorous solution of a soft part.

Genus CXLVI. Herpes; a great number of phlyctenæ or small ulcers, gathering in clusters, creeping, and obstinate.

Genus CXLVII. Tinea; small ulcers among the roots of the hair of the head, pouring out a humour which changes to a white friable scurf.

Genus CXLVIII. Psora. Itchy pustules and little ulcers of an infectious nature, chiefly infesting the hands.

Genus CXLIX. Fractura; bones broken into large fragments.

Genus CL. Caries; an exulceration of a bone.

Having thus presented to our readers Dr Cullen's general systematic view of all the diseases to which the human body is subjected, we come next to give a more particular account of the more important affections, treating of them in the order which Dr Cullen has arranged them.

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Class I. PYREXIÆ, or the Febrile Diseases.

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Order I. FEBRES, Or Fevers strictly so called.

Sauvag. Clafs II. *Vog.* Clafs I. *Sagar.* Clafs XII. Morbi Febriles Critici, *Lin.* Clafs II.

Sect. I. INTERMITTENTS.

Intermittentes of some authors; *Sauv.* Clafs II. Order III. *Lin.* Clafs II. Order II. *Vog.* Clafs I. Order I. *Sag.* Clafs XII. Order III.

The *remittentes* of others, *Sauv.* Clafs II. Order II. *Sag.* Clafs XII. Order II.

Exacerbantes, *Lin.* Clafs II Order III.

Continuæ, *Vog.* Clafs I. Order II.

Genus I. TERTIANA; the Tertian Fever. Tertiana.

(*Tertiana*, Sauv. G. 88. Lin. 16. Hoffm. Stahl. Cleghorn Senac.

The *Genuine* Tertian. 126

(Tertiana legitima, *Senert. Hoffm. Cleghorn*, Minorc. *Sauv.* Sp I.)

1 *Description.* This disease, in its most regular form, consists of repeated paroxisms, returning every second day, the patient during the intermediate period enjoying apparently a state of good health. This is the most common form of ague, as it is commonly called in Britain. Each paroxysm consists of three parts, the cold, the hot, and the sweating stages. The paroxysm commonly begins with a remarkable shivering, increasing frequently to a convulsive shaking of the limbs. The extremities are always cold, sometimes remarkably so. The cold for the most part is first perceived about the lumbar regions, from thence ascending along the spine turns towards the pit of the stomach. Sometimes it begins in the first joint of the fingers and tip of the nose. Sometimes it attacks only a particular part of the body, as one of the arms, the side of the head, &c. This cold is often preceded by a heavy and sleepy torpor, languor, and lassitude, which we are partly to ascribe to real weakness and partly to mere laziness. To these symptoms succeed yawning and stretching; after which the cold comes on as above described, not unfrequently with a pain of the back, and a troublesome sensation of tension in the precordia and hypochondria. To this succeed nausea and vomiting: and the more genuine the disease, the more certainly does the vomiting come on; by which a great deal of tough mucous matter, and sometimes bilious stuff or indigested food is evacuated during the first paroxysms. In some there is only a violent straining to vomit, without bringing up any thing: sometimes, instead of these symptoms, a diarrhœa occurs; and this chiefly in weak, phlegmatic, and aged people, or where an indigested mucous saburra has long remained in the primæ viæ.

When these symptoms have continued for an hour or two, the cold begins to go off, and is succeeded by a lassitude, languor, and flaccidity of the whole body, but chiefly in the limbs, with an uneasy soreness as if the parts had been bruised; excepting in those cases where the nausea continues for a longer time. After this languor, a heat comes on, the increase of which is generally slow, but sometimes otherwise, with pain of the head, thirst, and bitterness in the mouth. The pulse is quick and unequal; sometimes beating 130 strokes in a minute. As soon as this heat has abated, a little moisture or sweat is observed to break forth; not always indeed in the first, but always in the succeeding paroxysms, and the urine lets fall a quantity of lateritious sediment. The whole paroxysm is scarce ever over in less than six hours, more frequently eight, and in violent cases extends to 12 hours; but that which exceeds 12 hours is to be reckoned a spurious kind, and approaching to the nature of continued fevers. All these symptoms, however, are repeated every second day, in such a manner that the patient is quite free from fever for at least 24 hours. The paroxysms return much about the same time, though sometimes a little sooner or later.

3. *Causes*

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3. *Causes of this disease, and persons subject to it.* The genuine tertian attacks men rather than women, young people rather than old; the latter being more subject to anomalous tertians. It likewise seizes the lusty and active, rather than the lazy and indolent. Those, however, who are apt to nauseate their meat, fall easily into a tertian fever. The cause, according to Dr Cullen, is the miasma of marshes, and that only. Other physicians have taken in many more causes, almost every thing indeed which debilitates the body: but the Doctor denies that any of these, though they may dispose the body for receiving the disease, or may augment it, can by any means produce it without the concurrence of the marsh miasma; and it cannot be denied, that it is a disease almost peculiar to marshy situations. Thus we find it very frequent in the fenny counties of Britain, although in other parts of this island it may be considered as a rare disease.

3. *Prognosis.* The genuine simple tertian, unless improper medicines be administered, is generally very easily cured; nay, the vulgar reckon it of such a salutary nature, that after it they imagine a person becomes more strong and healthy than before. Hippocrates has observed, that these fevers terminate of their own accord after seven or nine paroxysms. Juncker tells us, that it frequently terminates before the seventh paroxysm, but rarely before the fourth. He also denies that any thing critical is to be observed in its going off; but in this he differs from Vogel, who tells us, that the urine, for some days after the fever is quite gone off, appears slimy, and lets fall much sediment. The latter also informs us, that besides the common crisis by sweat and urine, the tertian hath one peculiar to itself, namely, dry scabby ulcers breaking out upon the lips. These sometimes appear about the third or fourth paroxysm; and then we may venture to foretel that the disease will go off spontaneously after the seventh. But though the disease be never dangerous, in cold climates at least, when properly treated; yet the improper use of hot and stimulating medicines may change it into a continued fever, more or less dangerous according to the quantity of medicines taken and the constitution of the patient; in which case the prognosis must be regulated by the particular symptoms which occur. In warm climates, however, the tertian fever may be considered as a much more dangerous disease; and unless the most powerful remedies be employed, the patient is in danger of falling a victim to every paroxysm.

A variety of theories have been proposed for explaining the phenomena of this affection; but we may easily assert, that every thing hitherto said upon the subject is highly unsatisfactory. For although it be now almost universally admitted, that this fever does arise from the effluvia of marshes, yet in what manner the action of those effluvia induces fever, and particularly why this fever returns in regular paroxysms, are questions with regard to which we are still totally in the dark. Dr Cullen, with much ingenuity, attempted to prove, that the remote causes of this, as well as of other fevers, operated by inducing a state of debility; that this debility gives rise to spasm, induces increased action, from which the phenomena are to be explained. But this theory is liable to no less numerous and unsurmountable objections than the exploded hypotheses which had before been proposed by others. For it is an undeniable truth, that debility often exists, even to the highest imaginable degree, without any fever; nay, that when fever has taken place, the debility is often much greater after it is entirely gone than at any period during its course. When spasm and increased action do take place, we have no reason to view them in any other light than merely as symptoms of the disease; and while they are often absent in this affection, they frequently occur in others where the sickness, anxiety, and other characterising symptoms of fever are entirely absent: and, upon the whole, a probable or rational theory of intermittents, as well as of other fevers, still remain to be discovered.

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Cure. The treatment of all genuine intermittents, whether *tertians*, quotidians, or quartans, being almost precisely the same, the general method of cure applicable to them all may be here given, to which it will be easy to refer when we come to describe the others.

In treating intermittent fevers, physicians have formed indications of cure according to their different theories. The followers of Boerhaave, Stahl, &c. who imagined that the disease proceeded from a lentor or other disorders in the blood, always thought it necessary to correct and evacuate these peccant humours by emetics and purgatives before they attempted to stop the disease by the Peruvian bark or any other medicine. The bark, indeed, among some, seems to be held in very little estimation by them; since Vogel affirms, that this medicine, instead of deserving to have the preference of all other febrifuge medicines, ought rather to be ranked among the lowest of the whole; and for this reason he ascribes the cures, said to be obtained by the use of the Peruvian bark, entirely to nature.

According to Dr Cullen, the indications of cure in intermitting fevers may be reduced to the following.

1. In the time of intermission, to prevent the return of the paroxysms.

2. In the time of paroxysms, to conduct these in such a manner as to obtain a final solution of the disease.

3. To take off certain circumstances which might prevent the fulfilling of the two first indications.

The first indication may be answered in two ways. 1. By increasing the action of the heart and arteries some time before the period of accession, and supporting that increased action till the period of accession be over, and thus to prevent the recurrence of that atony and spasm of the extreme vessels, which he thinks give occasion to the recurrence of paroxysms. 2. By supporting the tone of the vessels, and thereby preventing atony and the consequent spasm, without increasing the action of the heart and arteries, the recurrence of paroxysms may be prevented.

The action of the heart and arteries may be increased, 1. By various stimulant remedies internally given or externally applied, and that without exciting sweat. 2. By the same remedies, or others, managed in such a manner as to excite sweating, and to support that

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ſweating till the period of acceſſion be for ſome time paſt. 3. By emetics, ſupporting for the ſame time the tone and action of the extreme veſſels.

The tone of the extreme veſſels may be ſupported without increaſing the action of the heart and arteries, by various tonic medicines; as, 1. Aſtringents alone. 2. Bitters alone. 3. Aſtringents and bitters conjoined. 4. Aſtringents and aromatics conjoined. 5. Certain metallic tonics; and, 6. Opiates. A good deal of exerciſe, and as full a diet as the condition of the patient's appetite and digeſtion allow of, will be proper during the time of intermiſſion, and may be conſidered as belonging to this head. Although many particulars in this plan of cure are deduced from Dr Cullen's theory, yet there can be no doubt that the object chiefly to be aimed at is to employ ſuch remedies during the intermiſſions as will prevent a recurrence of the paroxyſm. Of all the remedies hitherto employed with this intention, the moſt celebrated, perhaps the moſt certainly effectual, is the Peruvian bark; or, to ſpeak more properly, the bark of the *Cinchona officinalis* of Linnæus. But it muſt be obſerved, that good effects are only to be expected from this medicine when given in ſubſtance and in large quantity; and for its uſe the following rules or obſervations have been given.

1. The bark may with ſafety be employed at any period of intermitting fevers, providing that at the ſame time there be neither a phlogiſtic diatheſis prevailing in the ſyſtem, nor any conſiderable or fixed congeſtion preſent in the abdominal viſcera.

2. The proper time for exhibiting the bark in intermittent fevers is during the time of intermiſſion, and it is to be abſtained from in the time of paroxyſms.

3. In the caſe of genuine intermittents, while a due quantity of bark is employed, the exhibition of it ought to be brought as near to the time of acceſſion as the condition of the patient's ſtomach will allow.

4. In all caſes of intermittents, it is not ſufficient that the recurrence of paroxyſms be ſtopped for once by the uſe of the bark; a relapſe is commonly to be expected, and ſhould be prevented by the exhibition of the bark repeated at proper intervals.

The advantage of adminiſtering the bark as early as poſſible, was fully aſcertained by Dr Lind in the years 1765, 66, and 67, during an uncommon prevalence of intermittents. When the diſeaſe was ſtopped by the bark immediately after the firſt or ſecond fit, which was the caſe with 200 of the Doctor's patients as well as himſelf, neither a jaundice nor dropſy enſued; whereas, when the bark could not be adminiſtered, on account of the imperfect remiſſion of the fever, or when the patient had neglected to take it, either a dropſy, jaundice, or conſtant headach, were the certain conſequences; and the violence of the diſeaſe was in proportion to the number of the preceding fits, or to the continuance of the fever. By every paroxyſm the dropſical ſwellings were viſibly increaſed, and the colour of the ſkin rendered of a deeper yellow. When the fever continued a few days without remiſſion, the belly and legs generally ſwelled; a violent headach, likewiſe, and vertigo, for the moſt part diſtreſſed the patient; ſo that ſome, even after the fever had left them, were not able to walk acroſs their chamber for a fortnight or three weeks. When the returns of the fever were regular and even, but ſlight, four or five fits of a ſimple tertian were ſometimes followed by the moſt dangerous ſymptoms; eſpecially in the year 1765, when theſe fevers raged with the greateſt violence. If, as frequently happened, a dropſical patient relapſed into the ague, there was an abſolute neceſſity for putting an immediate ſtop to it by the bark; and in upwards of 70 ſuch patients, Dr Lind obſerved the moſt beneficial effects to accrue from this practice. He never preſcribed the bark until the patient was free from all ſymptoms of the fever; but in that caſe, without regard to a cough, or any other chronical indiſpoſition, he ordered it to be given in large doſes.

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The bark has been often obſerved to fail in removing intermittents, from not continuing the uſe of it for a ſufficient length of time, from adminiſtering it in too ſmall a doſe, or from giving it in an improper form. It was a prevailing opinion, that an ounce, or an ounce and an half, of the bark, taken during one intermiſſion, is ſufficient to prevent the return of another paroxyſm. But this is not always the caſe; for a ſevere fit will often attack a patient who has taken ſuch a quantity. When this happens, the patient ought to perſevere during the following intermiſſions, with an increaſe of the doſe, till five or ſix ounces at leaſt have been taken. The medicine alſo ought not to be omitted as ſoon as one fit is ſtopped, but ſhould be continued in a ſmaller doſe, and after longer intervals, for at leaſt ten days or a fortnight. Even for ſeveral months after the diſeaſe is entirely removed, it would be adviſable to take a little bark occaſionally in damp weather, or during an eaſterly wind, to prevent a relapſe. Where the intervals between the fits are ſhort, as in quotidians and double tertians, from one to two drachms of it ought to be taken every two or three hours.

The form in which this medicine is adminiſtered is of ſome conſequence. Mucilages and ſyrups have been recommended to conceal the taſte of it; but, from various experiments, Dr Lind found nothing more effectual for this purpoſe than ſmall-beer or milk, eſpecially the latter. A drachm of bark mixed with two ounces of milk, and quickly drank, may eaſily be taken by a perſon of the moſt delicate taſte, and by waſhing the mouth afterwards with milk there will not remain the leaſt flavour of the bark; but if the mixture be not drank immediately, the bark will impart a bitter taſte to the milk. This medicine is commonly given in electuaries or boluſes; but Dr Lind obſerves, that in theſe forms it proves much leſs efficacious than when adminiſtered in juleps or draughts, with the plentiful addition of wine or ſpirits. He has remarked, that ſix drachms of powdered bark, given in a julep, conſiſting of one fourth or one third of brandy, is as effectual as an ounce of the powder in the form of an electuary, and proves leſs diſagreeable to the ſtomach. For patients unaccuſtomed to wine or ſpirits, each draught ſhould be warmed with ſpiritus ſalis ammoniaci, or tinct. myrrh. by both of which the efficacy of the bark is increaſed. Dr Lind is alſo fully convinced that wine or ſpirits improve the virtues of the bark much more than elixir vitrioli, tinct. roſar. or ſuch other medicines as have been recommended by different phyſicians.

For thoſe who nauſeate the bark from a weakneſs of

Febres of the stomach or other cause, he advises it to be given in clysters, in which form it is as efficacious as when taken by the mouth. For this purpose the extract is most proper with the addition of a sufficient quantity of the tinctura thebaica, in order to its being longer retained. For children labouring under intermitting fevers, Dr Lind orders the spine of the back to be anointed, at the approach of the fit, with a liniment composed of equal parts of tinctura thebaica and liniment sapon. which has often prevented it. If this should not produce the desired effect, he informs us, that two or three tea-spoonfuls of syrup. e. mecon. given in the hot fit, will generally mitigate the symptoms. But for the entire removal of the disease, after purging with magnesia alba, he prescribes a drachm of the extract. cort. Peruvian. with a few drops of tinct. thebaic. in a clyster, to be repeated every three hours for a child of about a year old. When the stomach is oppressed with phlegm, the magnesia frequently occasions vomiting, which should be promoted with warm water. The constant heaviness of the head occasioned by those fevers in such tender constitutions is best relieved by the application of a blister to the back.

The bark has also proved effectual for the cure of intermittents in children, even when externally applied, by putting the powder of it into a quilted waistcoat. Of its efficacy in this way several instances are related by Dr Samuel Pye in the second volume of Medical Observations and Inquiries. In short, so effectual was the bark found in removing these fevers when properly applied, that of between four and five hundred afflicted with them in the year 1765, Dr Lind lost only two, neither of whom had taken this medicine.

In all these fevers, a vomit was administered whenever the patient complained of a sickness and reaching to vomit, or was seized with a spontaneous vomiting; and the bark was never given till this sickness was removed, or a purgative taken to clear more perfectly the whole alimentary canal. In those patients who were troubled with a cough, attended with a pain in the side affecting the breathing, when the pain was not relieved by warm fomentations, the balsamum anodynum, or by a blister, the Doctor generally ordered a few ounces of blood to be taken away, and endeavoured to stop the fever as soon as possible by the administration of the bark; having found that every return of the fever increased all such pains.—When the headach was very violent, and harassed the patient during the intermissions, the success of the bark was rendered more complete by the application of a blister to the back.—A giddiness of the head, which is the symptom most commonly remaining after even a slight intermitting fever, was generally relieved by the sal C. C. and the bark in wine. The former of these was administered in the following manner.

℞ Aq. Alex. Simp. ℥vii.

Sal. C. C. ʒss.

Syr. e Cort. Aurant. ℥i. M. f. julep. Cap. cochlear. ij. subinde.

If from the continuance of the fever the patient was distressed with flatulence, a distension of the abdomen, and a swelling of the legs, a spoonful of tinctura sacra, with the addition of 30 drops of the spirit lavend. compos. was ordered to be taken every night.—A continuance of the bark, a change of air, and the cold bath, were often found requisite to prevent a relapse. Tertiana

Such is the method of cure recommended by this experienced author, who has also discovered the efficacy and success of opium in intermitting fevers. He informs us, that he has prescribed an opiate to upwards of 300 patients labouring under this disease; and he observed, that, if taken during the intermission, it had not the least effect either in preventing or mitigating the succeeding paroxysm: when given in the cold fit, it once or twice seemed to remove it; but when given half an hour after the commencement of the hot fit, it generally gave immediate relief.—When given in the hot fit, the effects of opium are as follow. 1. It shortens and abates the fit; and this with more certainty than an ounce of the bark is found to remove the disease. It generally gives a sensible relief to the head, takes off the burning heat of the fever, and occasions a profuse sweat. This sweat is attended with an agreeable softness of the skin, instead of the burning sensation which affects patients sweating in the hot fit, and is always much more copious than in those who have not taken opium. 3. It often produces a soft and refreshing sleep to a patient tortured in the agonies of the fever, from which he awakes bathed in sweat, and in a great measure free from all complaints.

The Doctor has always observed, that the effects of opium are more uniform and constant in intermitting fevers than in any other disease, and are then more quick and sensible than those of any other medicine. An opiate thus given soon after the commencement of the hot fit, by abating the violence and lessening the duration of the fever, preserves the constitution so entirely uninjured, that, since he used opium in agues, a dropsy or jaundice has seldom attacked any of his patients in those diseases. When opium did not immediately abate the symptoms of the fever, it never increased their violence. On the contrary, most patients reaped some benefit from an opiate given in the hot fit, and many of them bore a larger dose at that time than they could do at any other. The Doctor assures us, that even a delirium in the hot fit is not increased by opium, though opium will not remove it. Hence he thinks it probable, that many symptoms attending these fevers are spasmodic; but more especially the head-ach. However, if the patient be delirious in the fit, the administration of the opiate ought to be delayed until he recovers his senses, when it will be found greatly to relieve the weakness and faintness which commonly succeed the delirium Dr Lind is of opinion, that opium in this disease is the best preparative for the bark; as it not only produces a complete intermission, in which case alone that remedy can be safely administered; but occasions such a salutary and copious evacuation by sweat, as generally to render a much less quantity of bark requisite. He commonly prescribes the opiate in about two ounces of tinctura sacra, when the patient is costive, who is to take the bark immediately after the fit. By these means the paroxysm is shortened, and the intestines are cleansed,

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previous to the administration of the bark; as the opiate doth not prevent, but only somewhat retards, the operation of the purgative. When a vomit is given immediately before the paroxysm, the administration of the opiate should be postponed till the hot fit is begun.

In the administration of the Peruvian bark, care should be taken that it be of a good quality. And different opinions have been entertained with respect to the choice, even where there is no reason to believe that it has been adulterated by the mixture of other articles. For a long time, the preference was given to small quilled pieces of a pale coloured bark; but of late the red bark, which is generally in larger masses, of an apparently coarser texture, and evidently of a more resinous nature, has been highly celebrated by Dr Saunders and others. And in cases where it does not disagree with the stomach or excite looseness, it is admitted by the most accurate observers to be more powerful in preventing the return of intermittents. Whether the red bark be the product of a different species of the cinchona, or be obtained as well as the pale quilled bark from the cinchona officinalis, is not yet ascertained with sufficient accuracy.

A species of cinchona, distinguished by the title of *cinchona Jamaicensis*, has been discovered in Jamaica and other islands in the West Indies. A very accurate description of it has been given by Dr Wright of Jamaica in the Philosophical Transactions of London. The bark of this species also has been recommended in the cure of intermittents; but the advantages of it have not hitherto been sufficiently confirmed by experience. See CINCHONA and JESUITS *Bark*.

The barks of various trees readily cultivated in Britain, particularly different species of the salix, the prunus, the fraxinus, and the quercus, have by some been represented as no less efficacious than the Peruvian bark. But we may safely venture to assert, that although several of them may possess some power in stopping intermittents, yet that none hitherto tried can be considered as in any degree approaching to the cinchona in point of efficacy.

But although the Peruvian bark be the best cure for intermittents hitherto discovered, yet while it can by no means be represented as the only cure, it is very certain that other remedies have in different cases succeeded after the cinchona has failed. Cures have often been obtained by the use of different aromatics, bitters, and astringents. Many articles from the mineral kingdom also have been employed with advantage. And intermittents have unquestionably been in certain cases stopped by different preparations of iron, zinc, copper, lead, and mercury. But of all the articles of this nature, arsenic has of late been the most celebrated. Arsenic is on good grounds conjectured to be the basis of an article much employed in the cure of intermittents in some of the countries where they are most prevalent, and sold under the title of the *tasteless ague drop*. The great success attending the use of this article, led Dr Fowler, an ingenious physician of Stafford, to examine it with particular attention. And in a treatise which he has lately published, entitled *Medical Reports* on the effects of arsenic in the cure of agues, he has given a formula for an arsenical solution, which he has found very successful in affections of this kind, and which is probably very nearly the same with the tasteless ague drop. Dr Fowler's mineral solution, as he styles it, is found by dissolving 64 grains of arsenic and as much fixed vegetable alkaline salt in a pound of distilled water. This solution is given in doses from three to 12 drops, varied according to the condition of the patient, and repeated two or three times a-day. And where the Peruvian bark has failed in stopping intermittents, it seems to be one of the most powerful remedies yet discovered. But after all remedies prove ineffectual, intermittents are often stopped by change of season and of situation.

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But besides the remedies employed in tertian fevers and other intermittents, with the view of preventing the return of paroxysms, it is often also necessary to employ powerful articles with other intentions, particularly to mitigate and shorten the paroxysm when present; to obviate urgent symptoms, especially those of an inflammatory or putrid nature; and to obtain a complete apyrexia or intermission from fever after the paroxysm has ceased. With these intentions, recourse is not unfrequently had to emetics, laxatives, bloodletting, blisters, opium, diluents, or sudorifics, as the circumstances of the case may require.

The *Irregular* or *Spurious* TERTIAN. 127

Sp. I. var. 1. B.

Tertiana notha sive spuria, *Sauv.* sp. 2. *Sennert. Cleghorn. Hoffman.*

The characteristic marks of this fever are, that its paroxysms last longer than 12 hours, and consequently it inclines more to the quotidian or continued fever than the former. Its paroxysms have no stated hour of attacking. The cure, however, is precisely the same with that above described, observing the proper cautions already mentioned with regard to the use of the bark.

The *Double* TERTIAN. Sp. I. var. 2. C. 128

Tertiana duplex, *Sauv.* sp. 13. *Vog.* G. 12. *Sennert. Cleghorn*

Duplicata, *Lin.* 18.

The double tertian comes on every day; but differs from the quotidian in so far, that its paroxysms do not answer to each other singly, but alternately. The first day, for instance, the fit will come on in the forenoon, the second in the afternoon, the third in the forenoon, and the fourth in the afternoon.

Of these fevers we shall give the following description from Cleghorn's treatise on the diseases of Minorca: "They are called *double tertians* when there are two fits and two intervals within the time of each period. But commonly there is some difference between the two fits, either in respect of the hour they come at, the time of their duration, or the nature and violence of their concomitant symptoms. Some double tertians begin in this manner.—On the evening of Monday, for example, a slight fit comes on, and goes off early next morning; but on Tuesday, towards the middle of the day, a more severe paroxysm begins, and continues till night. Then there is an interval to Wednesday evening, when a slight fit commences a new period of the fever, which proceeds in the same manner as the first; so that (according to the way physicians calculate the days of diseases, by beginning to

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to reckon from the first hour of their invasion), both paroxysms happen on the odd days, while the greatest part of the even days is calm and undisturbed. But in most double tertians the patient has a fit every day of the disease; the severe one commonly appearing at noon upon the odd days, the slight one towards evening on the even days; though sometimes the worst of the two fits happen on the even days.

"There is a tertian fever sometimes to be met with, during each period of which there are three different fits, and as many intervals. For example, towards Monday noon the patient is seized with a paroxysm, which declines about five or six o'clock the same evening: a few hours after, another fit begins, and continues until morning: from which time there is an interval to Tuesday evening, when a third fit comes on, and lasts most part of the night. On Wednesday there are again two paroxysms, as on Monday and on Thursday, like that of Tuesday; and thus the fever goes on with a double fit on each of the odd days, and a single fit on the even days.

"In double tertians, that interval is the most considerable which follows the severe fit; for the slight fit oftener ends in a remission than intermission, and frequently lingers till the other approaches: Hence it is, that the night preceding the vehement fit is much more restless than that which comes after it, as has been observed by Hippocrates. In double tertians, the vehement fit often comes on a little earlier in each period, while the slight fit returns at the same hour, or perhaps later and later every other day: so that the motions of one have no influence on those of the other; from whence it appears, that each of these fits hath its own proper independent causes."

129 *Duplicated* TERTIAN. Sp. I. var. 2. D.

Tertiana duplicata, *Sauv.* sp. 14. *Jones. River.*

This hath two fits on the same day, with an intermediate day on which there are none. This also does not differ in any remarkable particular from those already described.

130 The *Triple* TERTIAN. Sp. I. var. 2. E.

Tertiana triplex, *Sauv.* sp. 15. *Cleghorn.*

Semitertiana, *Hoffman.*

Semitertiana primi ordinis, *Spig.*

This differs from the former in having a single and double fit alternately: thus, for instance, if there are two fits the first day, there is only one the second, two the third, one the fourth, &c. Its cure the same as before.

131 The *Semi*-TERTIAN. Sp. I. var. 2. F.

Hemitritæus, *Celf.*

Semitertiana, *Cleghorn.*

Semitertiana secundi ordinis, *Spig.*

Amphimerina hemitritæus, *Sauv.* sp. 8.

Amphimerina pseudo hemitritæus, *Sauv.* sp. 9.

The semitertian is described by Dr Cullen as having only an evident *remission* between its paroxysms; more remarkable between the odd and even day, but less so between the even and odd one. For this reason, he adds, that possibly some semitertians ought rather to be classed among the remittents; and owns that it is difficult to settle the boundaries between them. But Cleghorn, whom he quotes, describes it in the following manner. "A fit begins on Monday noon, for example, and goes off the same night. On Tuesday afternoon a second fit comes on, and gradually increases till Wednesday night, when it terminates. On Thursday morning there is such another interval as happened on Tuesday morning: But on Thursday afternoon another long fit like the preceding commences; and returning regularly every other day, leaves only a short interval of ten or twelve hours during the eight and forty.

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Concerning the cure of these fevers Dr Cullen observes, that though no entire apyrexia occurs, the bark may be given during the remissions; and it should be given even though the remissions be inconsiderable; if, from the known nature of the epidemic, intermissions or considerable remissions are not to be expected, and that great danger is apprehended from repeated exacerbations.

The *Sleepy* TERTIAN. Sp. I. var. 3. G. 132

Tertiana carotica, *Sauv.* sp. 10. *Werlhof.*

Tertiana hemiplegica, *Sauv* sp. 20. *Werlholf.*

Quotidiana soporosa, *Sauv.* sp. 8 *Car. Pis.*

Febris caput impetens, *Sydenham*, ep. ad R. Brady.

This, according to Vogel, is a most dangerous species, and very commonly fatal; for which reason he ranks it among those intermittents which he calls *malignant.* Sometimes he tells us the alarming symptom of a sleepiness comes on, not at the beginning of the disease, but will unexpectedly occur during the third, fourth, fifth, or sixth paroxysm. It commonly begins with the cold fit, and continues during the whole time of the paroxysm, and, becoming stronger at every succeeding one, at last terminates in a mortal apoplexy. Sometimes fevers of this kind rage epidemically. Vogel relates, that he saw a simple tertian changed into one of these dangerous fevers. The patient was a woman of a delicate constitution, and the symptom appeared in consequence of her being put in a violent passion: however, it occurred but once, and she recovered. Hoffman mentions a carus in a double tertian occurring seven times without proving mortal; tho' Vogel says, that the powers of nature are very seldom sufficient to conquer the disease.

In 1678, Dr Sydenham tells us that intermittents raged epidemically at London, where none had appeared before from 1664. Of them "it is to be noted (says he), that though quartans were most frequent formerly, yet now tertians or quotidians were most common, unless the latter be intitled double tertians; and likewise, that though these tertians sometimes began with chilness and shivering, which were succeeded first by heat, and soon after by sweat, and ended at length in a perfect intermission, returning again after a fixed time, yet they did not keep this order after the third or fourth fit, especially if the patient was confined to his bed and used hot cardiacs, which increase the disease. But afterwards this fever became so unusually violent, that only a remission happened in the place of an intermission; and approaching every day nearer the species of continued fevers, it seized the head, and proved fatal to abundance of person."

From this description of Sydenham's we may have an idea of the nature of the disease. As to its cure, Febres he strongly recommends the bark; telling us, that, even in the *most continued* kind of intermittents, "the nearer the intermittent approaches to a continued fever, either spontaneously, or from using too hot a regimen, so much the more necessary is it to exhibit a larger quantity of the bark; and that he took advantage of a remission, though ever so small.

133 The *Spasmodic* or *Convulsive* TERTIAN. Sp. I. var. 3. H.

Tertiana asthmatica, *Sauv.* sp. 6. *Bonet.*

Tertiana hysterica, *Sauv.* sp. 8. *Wedel.* A. N. C. Dec. I. A. II. obs. 193.

Hysteria febricosa, *Sauv.* G. 135. sp. 8. A. N. C. Dec. I. Ann. II.

Tertiana epileptica, *Sauv.* sp. 16. *Calder. Lautter.*

Quotidiana epileptica, *Sauv.* sp. 3. Edinb. Essays, vol. 5. art. 49.

Ecclampsia febricosa, *Sauv.* G. 133. sp. 17.

Epilepsia febricosa, *Sauv.* G. 134. sp. 9.

Tertiana tetanodes *Medici* Beobacht I. Band.

Tetanus febricosus, *Sauv.* G. 122. sp. 10. *Stork*, Ann. Med. II.

Tertians of this kind occur with very different symptoms from those of the true ones, and sometimes even with those which are very extraordinary. In some they are attended with symptoms of asthma, in others with those of hysterics, in others with convulsions. Where the symptoms of asthma occur, the disease must be treated with diuretics and antispasmodics joined with the bark. In the hysteric asthma the fit comes on with cold, yawning, cardialgia, terror and dejection of mind. The disease is to be removed by mild aperients and antihysterics joined with the bark.

Of the convulsive tertian we have a most remarkable instance in the Edinburgh Medical Essays, Vol. V. The patient was a farmer's son about 26 years of age, of a strong plethoric habit of body. He had laboured under an ague half a-year, and had taken a great deal of bark. While he was telling his case to the surgeon (Mr Baine of Pembroke), he was suddenly taken with a violent stamping of his feet; and the convulsions gradually ascended from the soles of the feet to his legs, thighs, belly, back, and shoulders. His head was then most violently convulsed, with a total deprivation of speech; but he had a most dismal vociferation, that might have been heard at a considerable distance, his abdomen and thorax working and heaving violently and unusually in the mean time. This fit having lasted half an hour, a profuse sweat broke out over all his body, which relieved him; and he then became capable of answering such questions as were put. These extraordinary fits, he said, had been occasioned by a fright, and his neighbours had concluded that he was bewitched. They returned sometimes twice a day, and always at the times the ague used to return. During the paroxysm his pulse was very high and quick, his face much inflamed, and his eyes ready to start out of his head. After the fit was over, he complained of a most torturing pain of the bowels. His tongue was generally moist, and he had a suppression of urine.—This formidable disease, however, was totally subdued by the use of the bark, mercurials, antispasmodics, opiates, and saline draughts.

The *Eruptive* TERTIAN. Sp. I. var. 3. I. Tertiana.

Tertiana petechialis, *Sauv.* sp. 3. *Donat. Lautter.*

Tertiana scorbutica, *Wedel.* A. N. C. Dec. I. A. II. obs. 193. 134

Tertiana urticata, *Sauv.* sp. 22. *Planchon.* Journ. de Med. 1765. *Cleghorn.*

Tertiana miliaris, *Sauv.* sp. 21. Walthier.

This species of tertian is accompanied with red or livid blotches on the skin, or an eruption like that occasioned by the stinging of nettles. In the latter case Dr Cleghorn says the disease is very dangerous; and as the former indicates an incipient dissolution and putrefaction of the blood, it must also be reckoned of very dangerous tendency.

The *Inflammatory* TERTIAN. Sp. I. var. 3. K. 135

Tertiana pleuritica, *Sauv.* sp. 4. *Valef. Lautt.*

Pleuritis periodica, *Sauv.* G. 103. sp. 14.

Tertiana arthritica, *Sauv.* sp 5. *Morton. Lautt.*

Sauvages inform us, that he has seen a true and genuine pleurisy having all the pathognomic signs of the disease, but assuming the form of an intermittent; that is, the patient is one day affected with the pleurisy, and the next seemingly in perfect health. He also tells us, that in the month of May 1760 a tertian raged epidemically, which after the third fit imitated a pleurisy, the pain of the side and difficulty of breathing coming regularly on, and the fever from an intermittent becoming remittent; the blood had also the same appearance with that of pleuritic persons, and the distemper yielded to bleeding and gentle cathartics.—Morton also informs us, that he has observed similar disorders an hundred times over, which were always certainly and safely cured by the Peruvian bark.

The TERTIAN *complicated* with other *Disorders.* Sp. I. var. 4. 136

Tertiana scorbutica, *Sauv.* sp. 9. *Etmuller. Timæus.*

Tertiana syphilitica, *Sauv.* sp. 17. *Deidier.*

Tertiana verminosa, *Sauv.* sp. 18. *Stisser.* in act. Helmstad. *Lanscis.* de noxis palud. *Pringle. Ramazzini. Van den Bosch.* de const. vermin.

The scorbutic tertian, according to Sauvages, is exceedingly anomalous, its periods being sometimes much anticipated, and sometimes much postponed. It is exceedingly obstinate, and will return if the body be not cleared of its scorbutic taint. The patient is affected with lancinating pains of a wandering nature. The urine lets fall a dusky red sediment, or a thick branny matter is copiously scattered up and down in it, seemingly tinged with blood. The usual symptoms of scurvy, viz. livid spots, and rotten fetid gums, also frequently occur. For this the Peruvian bark is very useful, both as a febrifuge and antiscorbutic.

A tertian accompanied with worms is taken notice of by Sir John Pringle in his treatise on the diseases of the army. The worms, he tells us, were of the round kind; and though we are by no means to reckon them the cause of the fever, they never failed to make it worse, occasioning obstinate gripings or sickness at stomach. In these cases stitches were frequent; but, being flatulent, were not often relieved by bleeding. The worms were discharged by vomiting

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as well as by stool. For discharging these worms, he commonly gave half a drachm of rhubarb with 12 grains of calomel; without observing any inconvenience from such a large dose of mercury. Anthelmintics, which act slowly, had little chance of doing good; for though worms will sometimes lie long in the bowels without giving much uneasiness to a person otherwise well, yet in a fever, especially one of a putrid kind (to which his intermittents always seemed to incline), the worms being disturbed by the increase of heat, and the corruption of the humours in the *primæ viæ*, begin to move about, and struggle to get out. Lancisius, who makes this remark, adds, that upon opening the bodies of some who had died at Rome of fevers of this kind, wounds were found in the intestines made by the biting of the worms; nay, that some of them had even pierced through the coats of the guts, and lay in the cavity of the abdomen. Pringle never had any instance of this; but knew many cases in which the worms escaped by the patient's mouth, though there had been no previous retching to bring them up. One soldier was thrown into violent convulsions, but was cured by the abovementioned powder.

137 The TERTIAN *varied* from its *Origin*. Sp. I. var. 5.

Tertiana accidentalis, *Sauv.* Sp. 12. *Sydenham.*
Tertiana a scabie, *Sauv.* sp. 12. *Juncker*, tab. 80. *Hoffman*, II. p. 12.

The existence of fevers of this kind, as we have already observed, is denied by Dr Cullen; the accidental fever of Sauvages was said to arise from any slight error in the non-naturals, and consequently was very easily cured. That which arose from the repulsion of the itch, was cured as soon as the cruption returned.

138 Remittent Tertian.

The TERTIAN with only a *remission* between the fits. Sp. II.

Tritæophya, *Sauv.* Gen. 85. *Sag.* p. 695.
Tritæus, *Lin.* 21.
Hemitritæa, *Lin.* 23.
Tertianæ remittentes et continuæ Auctorum.
Tertianæ subintrantes, proportionatæ, subcontinuæ, *Torti.*
Tertiana subcontinua, *Sauv.* sp. 19.
Quotidiana deceptiva, *Sauv.* sp. 2.
Amphimerina semiquintana, *Sauv.* sp. 24.
Tritæophya deceptiva, *Sauv.* sp. 10.
Causos *Hippocratis.*
Tritæophya causus, *Sauv.* sp. 2.
Febris ardens *Boerhaavii*, aph. 738?
Tertiana perniciosa, quæ simulata tertiani circuitus effigie lethalis, et mille accidentibus periculosissimis implicata, existit. *Lud. Mercatus.*
Tertiana pestilens, *P. Sal. Diversus.*
Tertiana maligna pestilens, *Riverii.*
Morbus Hungaricus. *Lang. Lemb. Sennert. Jordan.*
Languor Pannonicus, *Cober.*
Amphimerina Hungarica, *Sauv.* sp. 10.
Hemitritæus pestilens, *Schenck.* ex *Corn. Gamma.*
Febres pestilentes Ægyptiorum, *Alpin.*
Febris tertiana epidemia, *Bartholin.*
Febres epidemicæ, autumni 1657 et 1658, *Willis.*

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Febris synoches epidemica, ab anno 1658 ad 1664, et postea ab anno 1673 ad 1691, *Morton.*
Febres autumnales incipientes, *Sydenham.*
Affectus epidemicus Leidensis, *Fr. Sylvii.*
Morbus epidemicus Leidensis, 1669, *Fancis.*
Tertianæ perniciosæ et pestilentes, et febres castrenses epidemiæ, *Lancisi.*
Febres intermittentes anomalæ et mali moris, *Hoffman.*
Febris cholerica minus acuta, *Hoffman.*
Febris epidemica Leidensis, anno 1719, *Koker* apud *Haller*, Disp. tom. V.
Amphimerina paludosa, *Sauv.* sp. 19.
Febris paludum, *Pringle.*
Bononiensis constitutio hiemalis 1729, *Beccari* in A. N. C. Vol. III.
Amphimerina biliosa, *Sauv.* sp. 22.
Febris castrensis, *Pringle.*
Febris putrida epidemica, *Huxham de aëre ad ann.* 1729.
Febris biliosa Lausanensis, *Tissot.*
Tritæophya Wratislaviensis, *Sauv.* sp. 3. Hahn. Epidemia verna Wratislav. in App. ad. A. N. C. Vol. X.
Tritæophya Americana, *Sauv.* sp. 12.
Febris anomala Batava, *Grainger.*
Morbus Naronianus, *Pujati.*
Febris continua remittens, *Hillary's* diseases of Barbadoes.
Febris remittens Indiæ orientalis, *Lind.* diss. inaug. 1768.
Febris critica et febr. biliosa æstatis, *Rouppe.*
Febris remittens regionum calidarum, *Lind* on the diseases of hot climates.

A. Tertiana cholerica sive dysenterica, *Tort.* Therap. Special. lib. iii. cap. 1. *Lautter.* Hist. Med. cas. 6. 16. 17. 20. *Morton*, App. ad Exerc. II.

B. Tertiana subcruenta sive atrabilaris, *Tort.* ibid. Never seen by *Cleghorn.*

C. Tertiana cardiaca, *Tort.* ibid. *Lautter*, Hist. Med. cas. 15. 15. 23.
Amphimerina cardiaca, *Sauv.* sp. 5.
Tritæophya assodes, *Sauv.* sp. 6.
Febris continua assodes, *Vog.* 27.

D. Tertiana diaphoretica, *Tort.* ibid.
Tritæophya typhodes, *Sauv.* sp. 4.
Tritæophya elodes, *Sauv.* sp. 5.
Febris continua elodes, *Vog.* 21.

E. Tertiana syncopalis, *Tort.* ibid. *Lautter.* cas. 11, 12. 13. 15. 16.
Tritæophya syncopalis, *Sauv.* sp. 1.
Amphimerina syncopalis, *Sauv.* sp. 4.
Amphimerina humorosa, *Sauv.* sp. 6.
Febris continua syncopalis, *Vog.* 29.

F. Tertiana algida, *Tort.* ibid. *Lautter*, cas. 13.
Amphimerina epiala, *Sauv.* sp. 3.
Amphimerina phricodes, *Sauv.* sp. 7.
Tritæophya leipyria, *Sauv.* sp. 9.
Tertiana leipyria, *Sauv.* sp. 23. *Valcarenghi* Med. Ration. p. 18.
Febris continua epiala et leipyria, *Vog.* 19. et 24.

G. Tertiana lethargica, *Tort.* ib.
Tritæophya carotica, *Sauv.* sp. 7. *Lautter*, 1. 7. 14.

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Tertiana apoplectica, *Morton.* Exerc. I. cap. ix. hift. 25.

Tertiana foporofa, *Werlhof.* de febr. p. 6.

Febris epidemica Urbevetana, *Lancif.* de noxis pal. effluv. I. II. c. 3.

The remittent fevers are much more dangerous than the true intermittents, as being generally attended with much greater debility of the nervous fyftem and tendency to putrefcency in the fluids than the latter. Sauvages divides his tritæophya, a remittent tertian, into the following fpecies.

139 1. *Tritæophya fyncopalis*, or that attended with fainting. It begins like a tertian, with cold fucceeded by heat and profufe fweating; but attended with much more dangerous fymptoms, fuch as cardialgia, enormous vomiting, great weaknefs, fmall contracted pulfe, coldnefs of the extremities, and, unlefs timely affiftance be given, kills during the fecond or third paroxyfm.

140 2. The *caufus*, or burning fever of Hippocrates, returns every third day without any new fenfation of cold; and is attended with great thirft, heat, but without diarrhœa or fweat, and continues only for one week or two at the utmoft. It attacks chiefly young people of a robuft and bilious habit of body, who have been accuftomed to much exercife, and expofed to the fun during the heats of fummer, and have alfo ufed a phlogiftic regimen The tongue is dry, fometimes black; the urine of a red or flame colour; together with pain of the head, anxiety, and fometimes other fymptoms ftill more dangerous.

141 3. *Tritæophya Vratiflavienfis*, was a peftilential difeafe occafioned by famine, during which the people fed on putrid aliments: the air was infected by the vaft numbers of bodies of thofe flain in battle, and the inhabitants were alfo dejected by reafon of being deprived of their harveft, and other calamities; to all which was added the continuance of a calm in the atmofphere for a long time. It began with an acute fever, leipyria or coldnefs of the external parts and fenfation of burning heat inwardly; general weaknefs; pain of the head and præcordia; ferous or bilious diarrhœa; a delirium, in fome furious, and accompanied with a dread of being expofed to the air; on the fecond day the thirft was violent, attended with a bilious vomiting as well as diarrhœa, tough vifcid fpitting, fainting, burning heat in the bowels, the tongue dry and feeming as if burnt with a hot iron, a fuppreffion of the voice, anxiety, ftupor; after which quickly followed convulfions and death. In fome fevers a leipyria came on with an exceeding great cold of the extremities, prefently followed by an intolerable heat of the vifcera, with fymptomatic fweats, violent diarrhœa, followed by a very itchy miliary eruption. On the fourth day came on copious fweats, fpafms of the lower jaw, naufea, involuntary paffing of urine, flight delirium, a flux of ichorous matter from the noftrils, an exceeding tough fpitting, an epilepfy, and death. Profeffor Hahn, who gives the hiftory of this difeafe, was himfelf attacked by it, and fuffered in the following manner. On the firft day was a violent feverifh paroxyfm without rigor, a fharp pain in the occiput, and immediately an inflammatory pain over the whole head; the feet were extremely cold, and the extremities rigid with fpafms. The pain continued to increafe daily to fuch a degree, that the contact of the air itfelf became at laft intolerable; a dejection of mind and incredible weaknefs followed; he paffed reftlefs nights with continual fweating, heavy and pained eyes, and an univerfal fenfation of rheumatifm over the whole body. On the third day the pains were affuaged, but he had a very bad night. On the fourth day all the fymptoms were worfe, the feet quite chilled, the hands very red and agitated with convulfive motions; he was terrified with apprehenfions of death, and had a vomiting every now and then: this day fponges dipped in cold water were applied over the whole body, and he ufed cold water for his drink. On the eighth day the pulfe was convulfive; and the pains were fo violent, that they made him cry out almoft continually. On the ninth day he was delirious, and threw up fome grumous blood. On the 11th his pulfe was more quiet, and he had a fweat; a decoction of the bark was given: his voice was broken, his fpeech interrupted, and his teeth chattered upon one another. On the 12th his jaw was convulfed, he had a rifus fardonicus, and deafnefs; after which, the paroxyfms returned lefs frequently, and only towards night. On the 14th he had a chilling cold over the whole body, a cold fweat; frequent lotions were applied, and all the fymptoms became milder. On the 18th he had a quick delirium, but fainted as foon as taken out of bed; a fenfation of hunger, followed by copious fweats; profound fleep; an averfion from noife; every thing appeared new and extraordinary. On the 36th a cholera; on the 48th a fcaling off of the fkin, and falling off of the nails. This epidemic carried off above 3000 people at Warfaw. Frequent lotion of the body either cold or tepid, watery glyfters, and the copious introduction of watery fluids under the form of drink, were of fervice. But the moft favourable crifis was under the form of fome cutaneous eruption.

4. *Tritæophya typhodes.* The principal fymptom of this fever was a continual fweat with which the patients were almoft always wet; with paroxyfms returning every third day. Sauvages tells us, that he had twice an opportunity of obferving this fever; one was in the teacher of an academy, about 40 years of age, and of a melancholic temperament. He fweated every other night fo plentifully, that he was obliged to change his linen nine times; and even on the intermediate days was never perfectly free of fever, and had his fkin moiftened with fweat. The other was of a woman who went about in man's clothes, and was difcovered only after her death. The difeafe began with a flight fenfation of cold, after which fhe fweated for eight hours. It was attended with the higheft debility, anxiety, and at the fame time an infatiable hunger. 142

5. *Tritæophya elodes*, was an inflammatory epidemic, but not contagious, terminating about the 14th or 21ft day. The difeafe came on in the night-time, with difturbed reft, univerfal weaknefs, watchings, great heat and fweat, rednefs of the face and almoft of the whole body, fparkling eyes, the tongue dry and white; a hard, tenfe, and turgid pulfe: about the third day a kind of frenzy frequently came on with the feverifh paroxyfm, the forerunner of an univerfal miliary eruption; or, what was worfe, with purple fpots fo clofe together, that they looked like an eryfipelas of 143

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of the whole body. Sometimes blifters of the fize of fmall pearls, filled with acrid ferum, appeared on the neck, armpits, and trunk of the body, which were of all others the moft dangerous. There was a variety of the difeafe, which our author calls the *humoralis*, and in which the pulfe was foft and feeble, with greater weaknefs over the whole body, and the difpofition to fleep more frequent than in the other; the eyes languid; the tongue very white, but not dry; and worms were difcharged.

144 6 *Tritæophya affodes.* This fpecies arofe from a foulnefs of the primæ viæ, and the effluvia of waters in which hemp had been fteeped. It began with rigor, followed by great heats, reftleffnefs, toffing of the limbs, terrible faintings, immoderate thirft, drynefs of tongue, delirium, and at length exceffive watchings; thefe laft, however, were lefs dangerous than vertigoes or comatofe difpofitions, which brought on convulfions or apoplexies.

145 7. *Tritæophya carotica.* This had exacerbations every other evening; and its diftinguifhing fymptom was an exceffive inclination to fleep, preceded by a fevere headach, and followed by delirium, and fometimes convulfions; the tongue was black, and the patient infenfible of thirft after the delirium came on. In thofe cafes where the difeafe proved fatal, a fubfultus tendinum and other grievous fymptoms came on.

146 9. *Tritæophya leipyria* is only a variety of the tritæophya caufus, already defcribed.

147 10. *Tritæophya deceptiva.* This fpecies at firft affumes the appearance of a continued fever; but afterwards degenerates into a remittent, or even an intermittent. It is defcribed by Sydenham, but attended with no remarkable fymptoms.

148 11. The laft of Sauvages's fpecies of Tritæophya belonging to the remitting tertian is the *Americana*. This, according to Sauvages, is the ardent fever with which the Europeans are ufually feized on their firft coming to America, and generally carries off one half of them. Of this there are two varieties, the *very acute* and the *acute*. The very acute ends before the feventh day. It comes on a few days after the perfon's arrival, with lofs of appetite, with dyfpnœa and fighing from weaknefs, head-ach, laffitude, pain of the loins: a pyrexia fucceeds, with great thirft, fweat, and heat; the ficknefs increafes, naufea comes on, with vomiting of porraceous bile; the tongue rough, the extremities often cold; watching, furious delirium; and the patient frequently dies on the third day. Copious fweats, and a plentiful hemorrhagy from the nofe on the fifth day, but not fooner, are ferviceable; but a bilious diarrhœa is the beft crifis of all.

The acute kind terminates moft frequently on the ninth, but very rarely goes beyond the fifteenth day. Death frequently comes on between the fourth and feventh days. It begins with head-ach, pain in the loins, and fometimes fhivering; great laffitude, dyfpnœa, thirft; burning fever, increafing every third day; inflation of the abdomen, pain at the pit of the ftomach, naufea, and bilious vomiting. Such is the ftate of the difeafe within twenty-four hours. The eyes are red, and full of tears; the urine pellucid; there is a low delirium, and continual anxiety; the tongue is dry and red, and fometimes, though rarely, black, which is a ftill worfe fign; the pulfe, formerly ftrong and full, finks about the fourth day, and becomes tenfe and fpafmodic: if a carus then comes on, the patient dies the fifth or fixth day; but if the pulfe keeps up, and no carus comes on, a crifis is to be expected by fweat, by a copious hemorrhagy from the nofe, or, which is ftill more fafe, by a bilious diarrhœa, which is never falutary if it comes on before the fifth day.

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To the remitting tertian alfo belong the following fpecies mentioned by Sauvages, viz.

1. *Tertiana fubcontinua.* This begins like a genuine tertian, and at firft hath diftinct paroxyfms; but thefe grow gradually more and more obfcure, the difeafe acquiring daily more of the appearance of continued fever, by which it is to be diftinguifhed from the other varieties of this fpecies. It is not unfrequently joined with thofe fymptoms which attend the fatal fever already mentioned; as cardialgia, cholera, fyncope, &c. but in a much lefs degree. The difeafe commonly begins with little or no fenfe of cold, but rather a fenfation of heat; when the tertian is doubled, it has firft a flighter and then a more fevere fit; and thus goes on with an exacerbation on the even days: and though it fhould change from a double into a fingle tertian, we are ftill to fufpect it, if a weak fit is the forerunner of a very ftrong one. This change of the tertian into a continued fever is alfo to be prognofticated if a heat remarkable to the touch is perceived on the day of intermiffion, together with fome difturbance of the pulfe, thirft, and drynefs of the tongue; all of which fhow an univerfal tendency to inflammation: the fame is foretold by the urine being in fmall quantity, and very red, or of a faffron colour; alfo an ulcerous or aphthous inflammation of the throat, with difficulty of fwallowing, or any very fevere fymptom coming on in the beginning of the difeafe, excepting only a delirium, which is eafily removed. 149

2. *Quotidiana deceptiva.* This is a diforder of an inflammatory kind, with a ftrong tendency to putrefcency, and fometimes affumes the form of a quotidian. In it the patient frequently complains of cold when he really is hot, and the remiffion is very indiftinct; and the difeafe is known by the great languor of the patient and the foulnefs of his tongue. 150

3. *Amphimerina cardiaca* is an acute malignant fever, with daily exacerbations, attended with fainting and vomiting of green bile. Afterwards, the weaknefs increafing, the patient's extremities grow cold, and a profufe fweat comes on, which is frequently fucceeded by death on the fourth day. Another fpecies refembling this Sauvages calls the *fyncopalis*; but the cardiaca differs from it in being attended with cardialgia. 151

4. *Amphimerina paludofa.* This is the fever defcribed by the Britifh phyficians under many different names, and appearing under various forms, according to the different conftitutions of the patients. This fever in the Eaft Indies, according to Dr Lind of Windfor, generally comes on fuddenly, and begins with a fenfe of debility and a very great lownefs of fpirits. Thefe fymptoms are attended with a greater or lefs degree of chillinefs, a dizzinefs, a naufea, very acute pains in the head and loins, and a trembling of the hands; the countenance is pale, the fkin commonly very dry and corrugated, the eyes dull and heavy the pulfe quick and fmall, the breath generally difficult, and interrupted with hiccough. 152

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As the paroxyfm increafes, the chillinefs now and then gives way to irregular heats, which foon become violent and permanent; the naufea likewife increafes; and in fome there comes on a vomiting, in which they throw up a great deal of bile. Sometimes bile is likewife voided by ftool. The fkin grows red; the eyes fmall, and fometimes not a little inflamed. The pulfe becomes fuller, and the breath more difficult, attended with great reftleffnefs and a troublefome thirft; notwithftanding which (fo great is the naufea) the patient cannot endure any kind of liquids. The tongue becomes foul, and the pain of the head and loins more violent; a delirium then follows; a flight moifture appears on the face, and from thence fpreads to the other parts; whilft the violence of the other fymptoms abates, and fhows the beginning of a remiffion, which is completed by plentiful fweats.

On the fever's remitting, the pulfe returns almoft to its natural ftate; the pains of the head and loins ftill continue, though fomewhat lefs violent, as likewife the naufea and want of appetite. When the difeafe gains ftrength, the remiffion is fcarcely obvious, and is immediately followed by another paroxyfm; which begins, not indeed with fo great a fhivering, but is attended with a greater pain of the head, the greateft anxiety, a heartburn, naufea, vomiting, and bilious ftools. The matter moft commonly evacuated by vomit and ftool is whitifh like chalk and water, or curdled milk which is vomited by fucking children, when the curd is much broke down. A heat, immoderate thirft, and delirium, now come on. The tongue becomes more foul; the teeth and infide of the lips are covered with a black cruft; the breath grows hot and fetid: another remiffion enfues, attended with a fweat; but this remiffion is both fhorter and lefs obvious than the firft.

This fecond remiffion is fucceeded by a paroxyfm, in which the fymptoms are far more violent than in the former; that which the patient difcharges by vomiting and purging is more fetid; the mouth, teeth, and infide of the lips, are not only covered with a black cruft, but the tongue becomes fo dry and ftiff, that the patient's voice can fcarce be heard. Violent delirium, with reftleffnefs and anxiety, come on chiefly during the paroxyfm; nor do thefe fymptoms abate till the fever remits, and the patient fweats.

When the fever becomes fo violent, during the third fit, as to end in death, which is generally the cafe, fome of the fick have a coma; in others the delirium becomes more violent The difcharges now become more fetid, and have a cadaverous fmell; the ftools are involuntary; the pulfe is fo quick, fmall, and irregular, that it is fcarce to be counted, or even felt; a cold fweat is diffufed over the whole body, efpecially the head and neck: the face becomes Hippocratic and convulfed; the patient picks the bed-clothes; a fubfultus tendinum comes on; the fick lie conftantly on their backs, and infenfibly flide down to the foot of the bed; their extremities grow cold; they are then feized with convulfions, with which the fcene clofes.

In this fever, the urine, which at the beginning is pale, becomes of a deeper colour by degrees, but without depofiting any fediment. There feldom or never appear any petechiæ, and the prickly heat which was before on the fkin vanifhes on the firft appearance of the fever. But though thefe were the general fymptoms of this diforder, they varied in the different fubjects, and at different feafons of the fame year. The pulfe, for example, in fome, was quick in the beginning of the diforder; in others, it varied with the other fymptoms. The fkin was generally dry in the beginning of the fit; but in fome it was moift, and covered with fweat from the very firft beginning of the difeafe. In the month of September, when the diforder raged moft, the remiffions were very imperfect and obfcure; but, on the return of winter and the healthy feafon, they became more regular, and the difeafe affumed the appearance of an intermitting fever, to fuch a degree as at length not to be diftinguifhed from it. In fome the remiffions could fcarce be perceived, and the fever continued for two weeks without any material change for the better or the worfe. At this time numbers were feized with it. When the diforder continued for any time without a change, it generally ended in death; while the weather grew better, it fometimes, in the fpace of a few days, from a common fever became an intermitting one, and the patient recovered, unlefs his liver, which was fometimes the cafe, happened to be affected. The cure of an inflammation of the liver proved uncertain and tedious; as it was commonly followed by a colliquative diarrhœa, which generally endangered the patient's life.—Every fucceeding paroxyfm was obferved to be more dangerous than the preceding; the third generally proved fatal; fome died during the firft. When this happened, the fever, in the language of the country, was called a *puca*, that is a ftrong fever.

This difeafe, according to Dr Lind of Haflar hofpital, is the autumnal fever of all hot countries, the epidemic difeafe between the tropics, and the difeafe moft fatal to Europeans in all hot and unhealthy climates. All authors agree that intermittents in general, but particularly this dangerous kind of them, are produced by heat and moifture. Dr Lind of Windfor remarks, that the European feamen are very fubject to the fever above mentioned when they happen to arrive at Bengal in autumn. They are predifpofed to it from the nature of their food, their confinement on board, the very great heats to which they are expofed during the voyage, and their lying for hours together expofed to the night colds.

Moft of the meat ufed by the crews of thofe fhips is falted, and often in a putrid ftate, without any frefh vegetables, they having only bifcuits, and fome other farinaceous matters. The quantity of the vinous or fpirituous liquors allowed them is by far too fmall to fubdue the putrefcent difpofition of their animal-food. Their fluids confequently become, from day to day, more and more putrefcent, and of courfe the more apt to breed and contract this diforder. This difpofition is likewife induced by their being ftowed very clofe together, and that for a confiderable length of time, and in a foul air, efpecially when the weather happens to be too ftormy to permit the hatches and port-holes to be kept open.

Though the heats they endure in the voyage to India are lefs confiderable than thofe of the country itfelf, yet they are too much for an European conftitution

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to bear. The general heat at sea within the tropics is about 84° of Fahrenheit's thermometer, which is sufficient to relax them, and promote a corruption of their humours, especially when it coincides with the above causes. It likewise creates a languor and indolence, which alone are sufficient to increase that putrescence. These causes are apt to be considerably aggravated by the mens being often exposed, when on duty, for hours together, to rain, damp, and cold air; a circumstance which frequently happens to them when working their ships up the river Ganges in the night-time. Hence the perspiration is checked, and the excrementitious fluid which used to be discharged by the skin being retained in the body, contributes, he thinks, very much towards the predisposition to this disease.

But the most powerful of all the remote causes is justly thought to be the effluvia of marshes replete with putrid animal-substances. We have not, however, been able to determine from what kind of putrid animal-substances these effluvia derive their virus. For that every kind of putrefaction has not such an effect appears from this, that neither practical anatomists, nor those who by their trades are exposed to the putrid effluvia of animals, for instance such tanners and butchers as keep their shops and stalls very dirty, are more subject than others to putrid diseases. Nor are the ship-stewards and their servants, whose business it is to deliver out their provisions to the ships crews, and who spend the most of their time amongst the putrid and rancid effluvia of the places in which those provisions are kept, more subject to putrid fevers than their ship mates. But whatever be in this, we are well assured that some particular putrid fermentations produce noxious vapours, which, united with those of marshes, render them more pernicious. Hence evidently proceeds the extreme unhealthfulness of a place called *Culpi* on the eastern bank of the Ganges. The shores about it are full of mud, and the banks covered with trees. Opposite to the place where the ships lie there is a creek, and about a mile from its entrance stands the town of Culpi: the ships lie about a mile from the shore. None of the sailors on board the ships stationed at this place enjoyed their health. The burying ground also contributed not a little to spread the infection The ground being marshy, the putrid water flowed from the old graves into the new ones, which infected the grave-diggers and those that attended the funerals; and from this cause many were suddenly seized while they were performing the last duty to their companions. This place has ever been remarkable for the unhealthfulness of its air. It was once customary to send some of the Company's servants here to receive the cargoes of the ships, and send them to Calcutta; but so many of them died on this duty, that the Company was at length obliged to dispense with it.

Hence it plainly appears, how apt putrid animal and vegetable substances are to render the effluvia of fenny places more pernicious than they would otherwise be. The reason why great inundations of the Nile and Ganges are followed by a healthy season is, that by this means the putrid animal and vegetable substances dispersed over the contiguous countries are carried off into the sea.—The noxious vapours arising from fens spread but a little way. Dr Lind has often known ships crews at a very little distance from the shore quite free from this disorder. But although these marsh miasmata first bring on the disease, yet contagion particularly spreads it, and renders it more epidemic. Thus the Drake East Indiaman continued free from the disorder for two weeks together, when she had no communication with the other ships; whereas, as soon as the disorder was brought on board, many were seized with it within a few days in such a manner as to leave no room to entertain the least doubt concerning its pestilential nature.

Dr Lind of Haslar hospital has given a very curious and learned account of the appearance of this fever throughout the various parts of the globe. It was very common in England in the years 1765 and 1766, one obvious cause of which was the prevalence of the eastern wind. This wind in England is often said to bring with it a fog from the sea; but the truth of the matter is, that in many places of this island the east-wind frequently raises a copious vapour from water, mud, and all marshy or damp places. To this exhaling quality of the eastern wind Dr Lind has often been an eye-witness. When the wind changes to the east, the mud sometimes sends up a vapour as thick as smoke; and the doctor has observed two fish-ponds in his neighbourhood, one of fresh and the other of salt water, which on the approach of an easterly wind sometimes also emit a dense vapour, as from a pot of boiling water. In order to view this phenomenon distinctly, the person should stand at about 100 yards distance from the mud or ponds. If the sun shines when the wind changes to the east, he will observe a constant steam of vapours arising out of the ponds, from about five to ten yards in height, while the air about him remains serene. As the vapour or fog arising from other bodies glides along the surface of the earth, and is brought by the easterly wind to the ponds, he will still be able, for some time, to distinguish the vapours ascending perpendicularly out of the ponds from those which are carried in an horizontal direction by the wind; especially if the sun continues to shine, though faintly.

This evaporating quality of the east-wind seems to manifest itself also by its effects both on the thermometer and the human body; for a thermometer hung over a damp piece of ground during the fogs or exhalations arising from it, will often indicate a degree of cold below the freezing point. The chilliness of the body, so sensibly perceived when in this situation, seems to proceed from the same cause, and to produce nearly the same sensations, which the damp arising from the wet floor in a chamber communicates to those who happen to be in it.

Winds are not constant in their effects. As we have sometime warm weather with a north-wind, and sometimes very little heat with one blowing from the south; so the fogs attending an east-wind are not constant, neither is the evaporation above mentioned at all times to be perceived. It is possible, however, that in all this there may be a deception; and that instead of supposing the quantity of vapours exhaled to be increased by an easterly wind, the coldness of that wind may only condense and render visible the vapours in the air at that time. But even this supposition is liable to great objections, as our coldest north-winds seldom or never produce such an effect, but on the contrary are attended with dry and serene weather.

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Be this as it will, however, an east-wind is usually accompanied with a cold, damp, and unwholesome vapour, which is observed to affect the health both of animals and vegetables, and in many places to produce obstinate intermitting fevers, and also to occasion frequent relapses. In particular spots of the low damp island of Portsea, the ague frequently prevails during the autumnal season, and in some years is much more frequent and violent than in others. It is also observable, that this disease always attacks strangers, or those who have formerly lived on a drier soil, and in a more elevated situation, with greater severity than those who are natives of the island.

The year 1765 was remarkable, not only for the long continuance of the easterly winds, but for an excessive degree of heat, which produced a more violent and general rage of those diseases than had been known for many years before. In the month of August the quicksilver in Fahrenheit's thermometer often rose to 82° in the middle of the day. This considerable addition of heat, together with the want of refreshing rains, greatly spread the fever, increased its violence, and even changed its form in many places. At Portsmouth, and throughout almost the whole island of Portsea, an alarming continual or remitting fever raged, which extended itself as far as Chichester. At the same time, the town of Gosport, though distant only one mile from Portsmouth, enjoyed an almost total exemption from sickness of every kind; whereas in the neighbouring villages and farm-houses, a mild regular tertian ague distressed whole families. The violence of the fever, with its appearances in a continued, remitting, or intermitting form, marked in some measure the nature of the soil. In Portsmouth the symptoms were bad, worse at Kingston, and still more dangerous and violent at a place called *Half-way Houses*; a street so named, about half a mile from Portsmouth, where scarcely one in a family escaped this fever, which generally made its first attack with a delirium. In the large suburb of Portsmouth called the *Common*, it seemed to rage with more violence than in the town, some parts excepted; but even whole streets of this suburb, together with the houses in the dock-yard, escaped its attack.

The marines, who were three times a-week exercised early in the morning on South Sea beach, suffered much from the effect of the stagnant water in an adjoining morass. Half a dozen of them were frequently taken ill in their ranks when under arms; some being seized with such a giddiness of their head, that they could scarcely stand; while others fell down speechless, and upon recovering their senses complained of a violent head-ach. When such patients were received into the hospital, it was observed that some few had a regular ague, but that far the greater number laboured under a remitting fever, in which sometimes indeed there was no perceptible remission for several days. A constant pain and giddiness of the head were the most inseparable and distressing symptoms of this disease. Some were delirious, and a few vomited up a quantity of bile; but in all the countenance was yellow. A long continuance of the fever produced a dropsy or jaundice, or both. Even a slight attack reduced the most robust constitution to a state of extreme debility; and this weakness, together with the giddiness, continued for a long time after the fever. A scabby eruption now and then made its appearance on the lips and the corners of the mouth: but dry itchy spots over the whole body, resembling much the common itch, and seeming to partake of the nature of that disease, were more frequently observed in the patients at Portsmouth, where there was not the least reason to suspect any infection.

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Such is the appearance of the remitting fever occasioned by marsh miasmata in England. In the Netherlands its symptoms are not much different. Dr Wind informs us, that at Middleburg, the capital of West Zealand, a sickness generally reigns towards the latter end of August, or the beginning of September, which is always most violent after hot summers. It commences after the rains which fall in the end of July; the sooner it begins the longer it continues, and it is only checked by the coldness of the weather. Towards the end of August and the beginning of September it is a continual burning fever, attended with a vomiting of bile, which is called the *gall sickness*. This fever, after continuing three or four days, intermits, and assumes the form of a double tertian; leaving the patient in a fortnight, or perhaps sooner. Strangers that have been accustomed to breathe a dry pure air do not recover so quickly. Foreigners in indigent circumstances, such as the Scots and German soldiers, who are garrisoned in the adjacent places, are apt after those fevers to have a swelling in their legs and a dropsy; of which many die.

These diseases, the Doctor observes, are the same with the double tertians common within the tropics. Such as are seized with the gall-sickness have at first some flushes of heat over the body, a loss of appetite, a white foul tongue, a yellow tinct in the eyes, and a pale colour in the lips. Such as live well, drink wine, and have warm clothes and good lodgings, do not suffer so much during the sickly season as the poor people; however, these diseases are not infectious, and seldom prove mortal to the natives.

Sir John Pringle observes, that the prevailing epidemic of autumn in all marshy countries, is a fever of an intermitting nature, commonly of a tertian form, but of a bad kind; which, in the dampest places and worst seasons, appears as a double tertian, a remitting, or even an ardent fever. But however these fevers may vary in their appearance according to the constitution of the patient and other circumstances, they are all of a similar nature. For though, in the beginning of the epidemic, when the heat or rather the putrefaction in the air is the greatest, they assume a continued or a remitting form, yet by the end of autumn they usually terminate in regular intermittents.

In Zealand, where the air is more corrupted than in other parts of the Netherlands, this distemper, as we have already observed, is called the *gall-sickness*; and indeed both the redundance and depravation of the gall is sometimes so great, that it has been generally ascribed to the corruption and overflowing of that humour. But though it cannot with justice be said to originate from corrupted gall or bile, it is certain that the disease may be continued, and the symptoms aggravated, by an increased secretion and putrefaction of the bile occasioned by the fever. In proportion to the coolness of the season, to the height and dryness of the ground,

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ground, this diftemper is milder, remits or intermits more freely, and removes further from the nature of a continued fever. The higher ranks of people in general are leaft liable to the difeafes of the marfhes; for fuch countries require dry houfes, apartments raifed above the ground, moderate exercife, without labour in the fun or evening damps, a juft quantity of fermented liquors, plenty of vegetables, and frefh meats. Without fuch helps, not only ftrangers, but the natives themfelves are fickly, efpecially after hot and clofe fummers. The hardieft conftitutions are very little excepted more than others: and hence the Britifh in the Netherlands have always been fubject to fevers.

By this diftemper the Britifh troops were haraffed throughout the whole of the war from 1743 to 1747. It appeared in the month of Auguft 1743; the paroxyfms came on in the evening, with great heat, thirft, a violent headach, and often a delirium. Thefe fymptoms lafted moft of the night, but abated in the morning, with an imperfect fweat, fometimes with an hæmorrhagy of the nofe or a loofenefs. The ftomach from the beginning was difordered with a naufea and fenfe of oppreffion, frequently with a bilious and offenfive vomiting. If evacuations were either neglected, or too fparingly ufed, the patient fell into a continued fever, and fometimes grew yellow as in a jaundice. When the feafon was further advanced, this fever was attended with a cough, rheumatic pains, and fizy blood. The officers being better accommodated than the common men, and the cavalry who had cloaks to keep them warm, were not fo fubject to it: and others who belonged to the army, but lay in quarters, were leaft of all affected; and the lefs in proportion to their being little expofed to heats, night-damps, and the other fatigues of the fervice.

In this manner did the remitting fever infeft the army for the remaining years of the war; and that exactly in proportion to their diftance from the marfhy places, of which we have feveral notable inftances in Pringle's obfervations. In Hungary the fame difeafe appears with ftill more violence, and is readily complicated with fevers of a truly peftilential nature, by which means it becomes extremely dangerous. Hungary is acknowledged to be the moft fickly climate in Europe, and indeed as bad as any in the world. Here it was where the crufaders, in only marching through the country to invade Afia, often loft half their number by ficknefs; and where the Auftrians not long fince buried, in a few years, above 40,000 of their beft troops, who fell a facrifice to the malignant difpofition of the Hungarian air. The reafon of this uncommon malignity is, that Hungary abounds with rivers, which, by often overflowing, leave that low flat country overfpread with lakes and ponds of ftagnating water, and with large unwholefome marfhes. So great is the impurity of thefe ftagnated waters, that by them the rivers, even the Danube, whofe courfe is flow, become in fome places corrupted and offenfive. The air is moift, and in fummer quite fultry. In the nights of harveft, Kramer tells us, it was fo very damp, that the Auftrian foldiers could not fecure themfelves from the moifture even by a triple tent-covering. Here epidemical diftempers begin conftantly to rage during the hotteft months of the year; which are July, Auguft, and September: and thefe complaints, according to the obfervations of the phyfician above-mentioned, are the fame with thofe which are epidemic upon the coaft of Guinea, and in the fickly climates of the Eaft and Weft Indies, of which malignant fevers of the remitting and intermitting kind are the moft common and dangerous.

The heat of the fun in Hungary, according to the fame author, is more intenfe than in any other country of Europe; and in proportion to the heat is the peftilential quality of the marfhy exhalations. It is conftantly obferved, that the nearer any city or fort is to a morafs or a large river with foul and oozy banks, the more unhealthy are the inhabitants. At fuch feafons and places, the air fwarms with numberlefs infects and animalcules, a fure fign of its malignant difpofition; and the hotter the fummer, the more frequent and mortal are the difeafes. In fhort, this country, on account of its unhealthinefs, has been termed *the grave of the Germans*; and in Italy, the Campania of Rome is almoft equally unhealthy. Lancifius, phyfician to Pope Clement XI. furnifhes us with a very ftriking inftance of the malignant quality of the air of Campania. Thirty gentlemen and ladies of the firft rank in Rome having made an excurfion, upon a party of pleafure, towards the mouth of the Tyber, the wind fuddenly fhifting, blew from the fouth over the putrid marfhes, when 29 were immediately feized with a tertian fever, only one efcaping.

The ifland of Sardinia is annually vifited with an epidemical ficknefs, which rages from June to September, and is called by the natives the *intemperies*. In fome years there is a want of rain for four or five months; and then it is that this ficknefs exerts its utmoft violence, being always more fatal in fome places than in others, and in particular to ftrangers. Of this the Britifh had a fevere proof in 1758.—Admiral Broderick, in the Prince fhip of war, anchored in the bay of Oriftagni, where 27 of his men, fent afhore on duty, were feized with the epidemical diftemper of this ifland; twelve of them in particular, who had flept on fhore, were brought on board delirious. All of them in general laboured under a low fever, attended with great oppreffion at the breaft and at the pit of the ftomach, a conftant retching, and fometimes a vomiting of bile; upon which a delirium often enfued. Thefe fevers changed into double tertians, and terminated in obftinate quartan agues. It is worthy of remark, that in this fhip, which lay only two miles from the land, none were taken ill but fuch as had been on fhore, of whom feven died. The prior of a convent, making a vifit to the Englifh officers, informed them, that the intemperies of the ifland was a remitting or intermitting fever, and that he himfelf had fuffered feveral attacks of it. Sardinia was formerly fo remarkable for its unwholefome air, that the Romans ufed to banifh their criminals thither; and it is at prefent but thinly peopled, owing to the mortality occafioned by this annual ficknefs. For although it is about 140 miles long, and in feveral places 75 miles broad, yet it is computed that the whole number of its inhabitants does not exceed 250,000: an inconfiderable number, when compared with the inhabitants of the leffer, but comparatively more healthful, ifland of Corfica; though even there the French loft a number of their troops by intermitting and remitting fevers.

 vers. In the island of Minorca, too, Dr Cleghorn informs us, that fevers of this kind prevail exceedingly; that their types are various, their symptoms violent, the intermiſſions fallacious, and that they frequently and ſuddenly prove fatal. It is more than probable, he adds, from the accounts of ſeveral phyſicians and travellers, that epidemical tertians are not wholly confined to the coaſts and iſlands of the Mediterranean, but that they are equally frequent and deſtructive in many other parts of the globe; and perhaps may be deemed the anniverſary autumnal diſtempers of moſt hot countries in the world. And though in the mild climate of Britain, a tertian may always eaſily be cured when once it is diſcovered; yet in warm climates, ſuch is the rapid progreſs of the diſtemper, that it is neceſſary to know it in the very beginning, which is very difficult for thoſe who have never ſeen any but the tertians uſually met with in Britain.

From Dr Cleghorn's account of Minorca, however, it doth not appear why that iſland ſhould be ſo much infeſted with fevers of this kind, ſince it is far from being a marſhy country; nay, on the contrary, is very dry. The ſouth wind, he obſerves, is very unhealthy; and it is the prevalence of this wind which brings on the fever: but ſtill the difficulty is not removed. becauſe the ſea-air is ſo far from bringing on ſuch dangerous diſeaſes, that it is one of the greateſt preſervatives againſt them when it can be had. As to the moiſture which muſt neceſſarily accompany an inſular ſituation, that cannot reaſonably be admitted as a cauſe of this or any other diſeaſe. In the London Medical Obſervations we find a paper on a ſubject very ſimilar to the preſent, namely, the miſchiefs produced by lying in damp ſheets, or being expoſed to moiſt vapour. The author tells us, that he hardly knows a diſtemper the origin of which hath not by ſome been aſcribed to lying in a damp bed, or ſitting in a wet room; and yet he does not know any one which will certainly be produced by theſe cauſes, and people frequently expoſe themſelves to ſuch cauſes without ſuffering any ill effects. "It muſt be owned indeed, (ſays he), that the vapours ariſing from the bilge-water of ſhips tend to produce a ſcurvy. The ſwampy plains alſo near the mouths of great rivers which are often overflowed, and low grounds which cannot readily be drained, and thoſe tracts of land where the thickneſs and extent of the woods keep the ground moiſt and half putrid for want of ventilation, are deſtructive to the neighbouring inhabitants, by occaſioning obſtinate intermittents in the colder climates, and peſtilential fevers in the hotter regions. But all this miſchief ariſes not merely from moiſture, but from an unventilated and putrid moiſture; for the inoffenſiveneſs of mere wetneſs, untainted with putridity, may be reaſonably inferred from the following conſiderations. The air is often fully ſaturated with moiſture, and could not be more filled by the vapours ariſing from a chamber covered with water; and yet neither is any epidemical diſtemper produced by it, nor are thoſe remarkably aggravated with which the ſick happen at that time to be afflicted. The air from rivers and from the ſea is probably more repleniſhed with vapours than inland countries cleared of their woods: yet the moſt celebrated of the ancient phyſicians recommended the bank of a running river for the ſituation of a houſe, on account of its peculiar healthfulneſs; and many invalids are ſent by the modern phyſicians to the ſea ſide, only for the benefit of the ſea air.

"Where the ſailors are cleanly, and not too much crowded, they are often as healthy during long voyages at ſea, as they would have been upon any part of the land. Venice is not obſerved to be leſs healthy than London or Paris.

"Thoſe who are much diſpoſed to ſweat, lie many hours in bed-clothes impregnated probably with a leſs wholeſome moiſture than would have been left in the ſheets half-dried after waſhing; and I have not yet had reaſon to think that any remarkable injury was done to the health by the continuance of ſuch ſweats almoſt every night for weeks, and for months, except what aroſe from the too great copiouſneſs of this evacuation.

"Children, and ſuch as are troubled with the ſtone, and thoſe who, from other infirmities or age, conſtantly wet their beds with their urine, do not appear to ſuffer in their health on this account.

"It is a common practice, in ſome diſorders, to go to bed with the legs or arms wrapped in linen cloths thoroughly ſoaked in Malvern water, ſo that the ſheets will be in many places as wet as they can be; and I have known theſe patients and their bedfellows receive no harm from a continuance of this practice for many months. Nor can it be ſaid that the Malvern water is more innocent than any other water might be, on account of any ingredients with which it is impregnated; for the Malvern water is purer than that of any other ſpring in England which I ever examined or heard of.

"The greateſt valetudinarians do not ſcruple to ſprinkle lavender-water upon their ſheets; and yet, when the ſpirit is flown off, there is left what is as truly water as if it had been taken from the river.

"Is it obſerved, that laundreſſes are peculiarly unhealthy above other women, though they live half their time in the midſt of wet linen, in an air fully ſaturated with vapours? Many other employments might be mentioned, the perſons occupied in which are conſtantly expoſed to wet floors or pavements, or to be ſurrounded with watery vapours, or to have their clothes often wet for many hours together.

"Is it the coldneſs of wet linen which is to be feared? But ſhirts and ſheets, colder than any unfrozen water can be, are ſafely worn and lain in by many perſons, who, during a hard froſt, neither warm their ſhirts nor their ſheets.—Or does the danger lie in the dampneſs? But then how comes it to paſs, that a warm or cold bath, and long-continued fomentations, can be uſed, without the deſtruction of thoſe who uſe them? Or is it from both together? Yet we have long heard of the thickneſs and continuance of the cold fogs in the ſeas north-weſt of England, but have never yet been told of any certain ill effect which they have upon thoſe that live in theſe countries."

With regard to the cauſes of fevers, however, Dr Lind is of opinion, that noxious vapours ariſing from the earth are for the moſt part to be blamed. Even in countries ſeemingly dry, and where violent rains are not

Febres not frequent, he thinks that the air may load itself with putrid exhalations from the ground; and that, except in the burning defarts of Arabia or Africa, people are nowhere exempt from difeafes occafioned by putrid moifture. In moft of the hot countries, however, the pernicious effects of the putrid vapours are by no means equivocal. In Guinea, they feem to be more extraordinary than any where elfe in the world; neither indeed can it be fuppofed, that a hot and moift atmofphere can be without putrefcency. It may in general be remarked, that in fultry climates, or during hot weather, in all places fubject to great rains, where the country is not cleared and cultivated, but is over-run with thickets, fhrubs, or woods, efpecially if there are marfhes or ftagnating waters in the neighbourhood, ficknefs may be dreaded, and particularly the remitting fever of which we now treat. The fens, even in different counties of England, are known to be very prejudicial to the health of thofe who live near them, and ftill more fo to ftrangers; but the woody and marfhy lands in hot countries are much more pernicious to the health of Europeans. In all thofe unhealthy places, particularly during fogs or rains, a raw vapour, difagreeable to the fmell, arifes from the earth, and efpecially in the huts or houfes. But of all the vapours which infeft the torrid zone, the moft malignant and fatal are the *harmattans:* They are faid to arife from the conflux of feveral rivers in the king of *Dormeo's* dominions at Benin (the moft unwholefome part of Guinea), where travellers are obliged to be carried on mens backs for feveral days journey, through fwampy grounds, and over marfhes, amidft ftinking ooze, and thickets of mangrove trees which are annually overflown. Thefe vapours come up the coaft to a furprifing diftance, with the fouth-eaft and north-eaft winds: and it has been obferved, that in their progrefs they have often changed both the courfe of the winds and of the fea currents. The times of their appearance at Cape Coaft are the months of December, January, or February. The north-eaft and fouth-eaft winds are always unhealthy, but particularly fo during the harmattan feafon. Some years this vapour is fcarcely perceptible; but in others it is thick, noxious, and deftructive to the blacks as well as whites.—The mortality is in proportion to the denfity and duration of the fog. It has a raw putrid fmell; and is fometimes fo thick, that a perfon or houfe cannot be difcerned through it, at the diftance of 15 or 20 yards: and it continues fo for 10 or 14 days; during which it opens the feams of fhips, fplits or opens the crevices of wood as if fhrunk or dried with a great fire, and deftroys both man and beaft.—In the year 1754 or 1755, the mortality occafioned in Guinea by this ftinking fog was fo great, that in feveral negro towns the living were fcarce fufficient to bury the dead.—Twenty women brought over from Holland by a new governor to the Caftle *del Mina*, perifhed, together with moft of the men in the garrifon. The gates of Cape Coaft caftle were fhut up for want of centinels to do duty; the blacks dying at this time as well as the white people. It is lucky that it is only in fome years that *harmattans* are fo very thick and noxious, otherwife that part of the country would be depopulated. It is obferved that all fogs are extremely unhealthy in thofe parts, particularly before and after the rainy feafons; but the above account of the *harmattans* appeared fo very extraordinary and incredible to fome of Dr Lind's readers, that he thought proper to publifh a further corroboration of the facts abovementioned. "A gentleman (fays he), who had long refided at Cape Coaft caftle, informed me, that during the time of this fog, being in the upper chambers of the fort, the boards of the floor fhrunk fo much, that he could difcern the candles burning in the apartments below him (there are no plafter ceilings ufed in thofe hot countries), and that he could then even diftinguifh what people were doing in the apartments below; the feams of the floor having opened above half an inch, while the fog lafted, which afterwards, upon its being difpelled, became clofe and tight as before."

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In this country the rains and dews feem to be poffeffed of qualities almoft equally pernicious with the fogs. This much is certain, that in Guinea, many of the principal negroes, and efpecially of the mulattoe Portuguefe, take the utmoft precaution to avoid being wet with thofe rains, efpecially fuch as fall firft. At the fetting in of the rainy feafon, they generally fhut themfelves up in a clofe well-thatched hut, where they keep a conftant fire, fmoke tobacco, and drink brandy, as prefervatives againft the noxious quality of the air at that time. When wet by accident with the rain, they immediately plunge themfelves into falt-water, if near it. Thofe natives generally bathe once a-day, but never in the frefh water rivers when they are overflown with the rains: at fuch times they prefer for that purpofe the water of fprings. The firft rains which fall in Guinea are commonly fuppofed to be the moft unhealthy. They have been known, in 48 hours, to render the leather of the fhoes quite mouldy and rotten; they ftain clothes more than any other rain; and foon after their commencement, even places formerly dry and parched fwarm with frogs. At this time fkins, part of the traffic of Senegal, quickly generate large worms; and it is remarked, that the fowls, which greedily prey on other infects, refufe to feed on thefe. It has been farther obferved, that woollen cloths wet in thofe rains, and afterwards hung up to dry in the fun, have fometimes become full of maggots in a few hours.—It is alfo probable, that as in fome of thofe countries the earth, for fix or eight months of the year, receives no moifture from the heavens but what falls in dews, which every night renew the vegetation, the furface of the ground in many places becomes hard and incruftated with a dry fcurf, which pens up the vapours below: until by the continuance of the rains for fome time, this cruft is foftened, and the long pent up vapours fet free. That thefe dews do not penetrate deep into the earth is evident from the conftant drynefs and hardnefs of fuch fpots of ground in thofe countries as are not covered with grafs and other vegetables. Thus the large rivers in the dry feafon being confined within narrow bounds, leave a great part of their channel uncovered, which having its moifture totally exhaled, becomes a folid hard cruft; but no fooner the rains fall, than by degrees this long parched up cruft of earth and clay gradually foftens, and the ground, which before had not the leaft fmell, begins to emit a ftench, which in four or five weeks becomes exceedingly noifome, at which time the ficknefs is generally moft violent.

This ficknefs, however, is not different from the remitting

Febres remitting fever which has been defcribed under fo many various forms and names. An inflammatory fever is feldom obferved, during the feafon of ficknefs, in this part of the world; and we fhall conclude our defcription of the *amphimerina paludofa* with fome extracts from the furgeon's journal of a fhip that failed up the rivers of Guinea.

"On the 5th of April we failed up the river of Gambia, and found all the Englifh in the fort in perfect health. The furgeons of the factory informed me, that a relaxation of the ftomach, and confequently a weakened digeftion, feemed to bring on moft of the difeafes fo fatal to Europeans in the fickly feafon. They were generally of a bilious nature, attended with a low fever, fometimes of a malignant, at other times of a remitting kind.—On the 12th of April, after failing 30 miles up the river St Domingo, we came to Catchou, a town belonging to the Portuguefe, in Lat. 20° N. In this town were only four white people, the governor and three friars. The number of whites in the trading fhips were 51. One morning, towards the latter end of April, a little rain fell. On the 13th of May there was a fecond fhower, accompanied with a tornado. On the 18th of May it rained the whole day; and the rain continued, with but fhort intervals, until the beginning of October.

"In the month of June, almoft two-thirds of the white people were taken ill. Their ficknefs could not be well characterifed by any denomination commonly applied to fevers: it however approached neareft to what is called a *nervous fever*, as the pulfe was always low, and the brain and nerves feemed principally affected. It had alfo a tendency to frequent remiffions. It began fometimes with a vomiting, but oftener with a delirium. Its attack was commonly in the night; and the patients, being then delirious, were apt to run into the open air. I obferved them frequently recover their fenfes for a fhort time, by means of the heavy rain which fell upon their naked bodies. But the delirium foon returned: they afterwards became comatofe, their pulfe funk, and a train of nervous fymptoms followed; their fkin often became yellow; bilious vomitings and ftools were frequent fymptoms. The fever reduced the patient's ftrength fo much, that it was generally fix weeks or two months before he was able to walk abroad. A confuming flux, a jaundice, a dropfy, or obftructions in the bowels, were the confequences of it. Of 51 white men, being the companies of four fhips which were at Catchou, one-third died of the fever, and one-third more of the flux, and other difeafes confequent upon it; and of thefe not one was taken ill till the rains began.

"I believe, on the whole face of the earth, there is fcarce to be found a more unhealthy country than this during the rainy feafon: and the idea I then conceived of our white people was by making a comparifon of their breathing fuch a noxious air, with a number of river-fifh put into ftagnating water; where, as the water corrupts, the fifh grow lefs lively, they droop, pine away, and many die.

"Thus fome perfons became dull, inactive, or flightly delirious, at intervals; and, without being fo much as confined to their beds, they expired in that delirious and comatofe ftate in lefs than 48 hours, after being in apparent good health. The white people in general became yellow; their ftomach could not receive much food without loathing and retchings. Indeed it is no wonder that this ficknefs proved fo fatal, that recoveries from it were fo tedious, and that they were attended with fluxes, dropfies, the jaundice, ague-cakes, and other dangerous chronical diftempers. It feemed more wonderful to me that any white people ever recover, while they continue to breathe fo peftiferous an air as that at Catchou during the rainy feafon. We were, as I have already obferved, 30 miles from the fea, in a country altogether uncultivated, overflowed with water, furrounded with thick impenetrable woods, and over-run with flime. The air was vitiated, noifome, and thick; infomuch that the lighted torches or candles burnt dim, and feemed ready to be extinguifhed: even the human voice loft its natural tone. The fmell of the ground and of the houfes was raw and offenfive; but the vapour arifing from putrid water in the ditches was much worfe. All this, however, feemed tolerable, when compared with the infinite numbers of infects fwarming every where, both on the ground and in the air; which, as they feemed to be produced and cherifhed by the putrefaction of the atmofphere, fo they contributed greatly to increafe its impurity. The wild bees from the woods, together with millions of ants, over-ran and deftroyed the furniture of the houfes; at the fame time, fwarms of cockroaches often darkened the air, and extinguifhed even candles in their flight; but the greateft plague was the mufquettos and fand-flies, whofe inceffant buzz and painful ftings were more infupportable than any fymptom of the fever. Befides all thefe, an incredible number of frogs on the banks of the river made fuch a conftant and difagreeable croaking, that nothing but being accuftomed to fuch an hideous noife could permit the enjoyment of natural fleep. In the beginning of October, as the rains abated, the weather became very hot; the woods were covered with abundance of dead frogs, and other vermin, left by the recefs of the river; all the mangroves and fhrubs were likewife overfpread with ftinking flime."

After fo particular a defcription of the remitting fever in many different parts of the world, we prefume it will be needlefs to take notice of any little varieties which may occur in the warm parts of America, as both the nature and cure of the diftemper are radically the fame: neither fhall we lengthen out this article with further defcriptions of remitting fevers from the works of foreign authors, as, from what we have already faid, their nature cannot well be miftaken.

Cure. The great difficulty in the cure of remitting fevers arifes from their not being fimple difeafes, but a complication of feveral others. Fevers, properly fpeaking, have but three or four different appearances which they can affume without a complication. One is, when they are attended with a phlogiftic diathefis; another is, when they affume the form of genuine intermittents; a third is, when they produce a great debility of the nervous fyftem; and the fourth is, when along with this debility there is alfo a rapid tendency to putrefaction. If, therefore, all thefe fpecies happen to make an attack at once, the moft dangerous fever we can imagine will be produced; and however contrary it may be to our theories to admit the poffibility of fuch

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such an attack, the truth of the fact is too often confirmed by fatal experience. In the beginning of remittent fevers, for instance, the symptoms indicate a high degree of inflammation: but if the practitioner attempts to remove this inflammation by blood-letting or other evacuations, the pulse sinks irrecoverably, and the person dies with such symptoms as show that the nervous system has been from the beginning greatly affected; at the same time the high stimulants and cordials, or the bark, which would have conquered the nervous part of the disease, increase the inflammatory part of it to such a degree, that, by a too early exhibition of them the patient also dies, but after another manner.

In the remitting fever of the East Indies, Dr Lind of Windsor formed the following indications of cure. 1. To allay the violence of the fever. 2. To evacuate the putrid humours, and take great care to prevent the body from inclining to putrefaction. 3. To keep up the strength of the patient as much as possible during the disorder. 4. To lose no time in preventing the return of the paroxysms.

To allay the violence of the fever, every thing that can contribute to increase it ought to be carefully avoided or removed; such as great heat, too strong a light falling on the eyes, noise, and motion. If during the paroxysm the head and loins be affected with violent pains, the pulse be full and hard, and the heat intense, bleeding may be used, but with the greatest caution: for, however useful this operation may be in cold climates, the success of it in warm ones is so far from being certain, that the lives of the patients have been often very much endangered, nay even destroyed by it. Dr Badenoch, and the surgeon of the Ponsborne, endeavoured each of them to relieve two patients by blood-letting; and the consequence was, that each of them lost one patient. Dr Lind bled two patients; one of whom was Mr Richardson, the first mate of the ship, who complained of a most violent pain in his head, with a full hard pulse. About four or five ounces of blood were taken from him, by which he was greatly relieved: nor was the cure retarded by it; nay, the fever afterwards became less irregular. At the time the other patient was bled, the disease was exceedingly frequent and violent. He was so earnest for bleeding, that he fired all the rest with the same desire, swearing, that by refusing them this only remedy, every one of them would be sent to their graves. To quiet them, therefore, and get quit of their importunities, the Doctor complied with their request, and took about five or six ounces from him who had been the first to require it. The consequence was, that he immediately lost his strength; and in less than an hour, during which time he made his will, was carried off by the next fit. It is necessary, however, to observe, and indeed the Doctor himself makes the observation, with regard to this patient, that he was bled at an improper time, namely, between the fits; whereas, had he been bled in the hot fit, it is possible he might have been relieved.

In support of the advantages to be derived from bleeding under proper circumstances, we have the authority both of Cleghorn and Pringle. As Dr Cleghorn practised in a very hot country, his observations must in the present case have greater weight than those of Pringle, who practised in a colder one. The former acquaints us, that if he was called in early enough, unless there was a strong contra-indication, he always used to take away some blood from people of all ages; namely, from robust adults, 10 or 12 ounces; from others a smaller quantity, in proportion to their strength and years. And further, if a violent head-ach, obstinate delirium, and great heat or pains of the bowels, were urgent, the bleeding was repeated within a day or two. By this seasonable evacuation, he found the vehemence of all the paroxysms somewhat diminished; the apyrexies became more complete; the operation of emetics and cathartics rendered safer and more successful; and the terrible symptoms which happened about the height of the distemper, such as raving *sopor*, difficulty of breathing, inflammations of the abdominal viscera, &c. were either prevented or mitigated. But if the fever had continued for some time before he was called, and the mass of blood appeared to be too much melted down or inclined to a putrid dissolution, he either abstained from bleeding entirely, or took away a very small quantity, though some importunate symptoms might seem to require a larger evacuation. As to the time of performing the operation, he acquaints us, that it is safe enough, except when the cold fit lasts or is soon expected, or while the skin is covered with critical sweats; and that he usually opened a vein in the beginning of the hot fit; by which means the sick were relieved, the immoderate heat of the body, which is often productive of fatal effects, was diminished, and the critical sweats brought on sooner and in greater abundance.

But though Dr Lind found venesection to be of such pernicious tendency in his patients, cooling acidulated liquors were of the utmost service, as they corrected the putrid humours, lessened the heat and thirst, and of course prevented the fever from arriving at so great an height as it would otherwise have done. Those cooling liquors are the best which are made up with some farinaceous substance, as they most easily unite with our fluids. Fossile acids too, and crystals of tartar, especially the latter, are of considerable use, not only in this but in other fevers. The neutral salts, prepared with the juice of lemons, were likewise given with success during the heat of the fever. They lessen the nausea, the fits become more regular, and the remissions more full; and they are particularly grateful when given in a state of effervescence. The good effects of these draughts we are in a great measure to ascribe to the antiseptic quality of the fixed air extricated from them during the effervescence; of which we shall speak more fully when treating of the typhous fevers.

During the remission, it is proper to evacuate the putrid humours by small doses of ipecacuanha, or rather tartar emetic. The tartar emetic indeed appears to be endowed with some kind of febrifuge virtue, which Dr Cullen thinks is owing to its relaxing the febrile spasm taking place in the capillary vessels. But should there appear any symptoms of a topical inflammation in some of the abdominal viscera, a thing which never happens unless the disorder has been of some standing, vomiting is to be avoided, and we are to depend upon purgatives alone for the evacu-

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evacuation of the putrid bile, which are always ufeful in the cure of this diforder. But all acrid and ftrong purgatives are to be carefully avoided, and only the mild antifeptic ones made ufe of, fuch as cryftals of tartar, or tamarinds made up with manna or with Glauber's falt.

Under the article GALL, we have obferved, from Dr Percival, the effect which vegetable acids have in fweetening putrid bile; whence it feems probable, that a liberal ufe of thefe acids would be much more ferviceable than a repetition of any kind of purgatives. Though in thefe difeafes there is a great quantity of putrefcent bile collected in the body, yet it feems much more probable that this is the *effect* rather than the *caufe* of the diforder; and therefore, though we carry off the quantity collected ever fo often, more of the fame kind will ftill be produced by the putrefcent difpofition of the other fluids, at the fame time that the ftrength of the patient muft neceffarily be diminifhed by repeated evacuations, when it ought rather to be kept up by all poffible means. We ought well to obferve, however, that the mineral acids have not that property of fweetening putrid bile which the vegetable ones have; and therefore the fame relief will not be given by them which might reafonably be expected from vinegar or lemon-juice.

In order to keep up the ftrength of the patient, good food is abfolutely neceffary. Dr Lind allowed the fick fmall meffes of panada made with boiled rice and barley mixed with currants or raifins and prunes, feafoned with fugar and a little wine, efpecially claret. During the paroxyfms, they had gruel made of flour and rice, with fugar and the juice of acid fruit; and when the fit went off, a little wine was added to this mixture.

The fhirts and bedding muft be very often changed and well aired; their ftools, and all filth and naftinefs, are to be immediately removed; the places where they are lodged fhould be well aired and frequently fprinkled with vinegar; and, in the laft place, the fick muft be exceedingly well nurfed. Blifters, according to Dr Lind, fhould never be ufed till the fever has been of long continuance, or the fpirits and pulfe of the patient have begun to flag. But here our author has implicitly followed Dr Huxham, whofe theory concerning the ufe of blifters is now found to be erroneous. According to that celebrated author, blifters are capable of doing confiderable hurt in all cafes where there is a tendency to inflammation, by increafing the motion of the fluids and the ofcillatory power of the veffels, both of which are already too great. They are alfo improper, according to him, where there is a confiderable tendency of the fluids to putrefaction; becaufe he fuppofes the falts of thefe flies to operate in the fame manner with volatile alkalies, that is, by diffolving and putrefying the blood ftill farther. But Sir John Pringle has fhown, that, in inflammatory fevers as well as thofe of the putrid kind, both blifters and volatile falts may be of fervice; the latter, particularly, he hath experimentally proved to be fo far from promoting putrefaction, that they are exceedingly ftrong antifeptics.

In the Eaft Indies, Dr Lind found it abfolutely neceffary to exhibit the bark in large quantities, and as early as poffible. By this method he not only fecured the patient from the imminent danger of death to which he was expofed at every fit, but likewife conquered thofe obftructions which were apt to enfue in the abdominal vifcera, and which are to be attributed to the continuance of the diforder, and not to the bark employed to cure it. He always gave the bark during the fecond remiffion, as all his care was during the firft to cleanfe the primæ viæ. He obferves, however, that it is to no purpofe to give the bark till the neceffary purgations are over; but affures us, that it never fails, unlefs from the coming on of a vomiting or diarrhœa it cannot be taken in fufficient quantities before the return of a paroxyfm. To prevent the medicine from vomiting or purging, he mixed a few drops of liquid laudanum with every dofe of it. Half a drachm was given every half hour in fome convenient vehicle, beginning as foon as the fever had confiderably abated, and the pulfe was returned nearly to its natural ftate; both which generally happened before the fweats were over. An ounce of the bark was fometimes found too little to check the fever, but an ounce and a half never failed. It muft be continued daily in fmall dofes till the patient has recovered his ftrength, and then a greater quantity muft be given, efpecially at the feafon when the rivers overflow the country.

Tertiana

Dr Pringle found the autumnal remittents in the Netherlands complicated with a great many inflammatory fymptoms; for which reafon it was generally found neceffary to open a vein in the beginning. The vernal and later autumnal remitting fevers are accompanied with pleuritic and rheumatic pains from the coldnefs of the weather, and on that account require more bleeding. A phyfician unacquainted with the nature of the difeafe, and attending chiefly to the paroxyfms and remiffions, would be apt to omit this evacuation entirely, and give the bark too foon, which would bring on a continued inflammatory fever. In thefe countries a vein may be fafely opened either during the remiffion or in the height of a paroxyfm; and our author alfo found good effects refulting from bleeding in the hot fits of the marfh-fever, even after it had almoft come to regular intermiffions. After bleeding, a purgative was ufually exhibited, of which he gives us the following formula.

R. Infufi fenæ commun. ℥iij.
Elect. Lenitiv. ℥fs.
Nitr. pur. ʒi.
Tinct. fen. ʒvi. M.

Of this only one half was taken at once; and if it did not operate twice in four hours, the remainder was then taken. This potion agreed with the ftomach, purged plentifully, and therefore was a very ufeful compofition. Next morning, when there was almoft always fome remiffion, he gave one grain of emetic tartar rubbed with 12 grains of crabs-eyes, and repeated the dofe in two hours, if the firft had little or no effect; or at any rate in four hours. This medicine was intended not only to vomit, but alfo to operate by ftool, and excite a fweat. If thefe evacuations were procured, the fever generally became eafier, and was even fometimes cured. This he prefers to the ipecacuanha, and therefore in the latter years of his practice difufed that root entirely. The fame medicine was repeated next day or the day following; or if not,

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not, a laxative clyster was thrown in: and this method was continued till the fever either went off altogether, or intermitted in such a manner as to be cured by the bark.

A similar method was followed by Dr Huck in the remitting fevers of the West Indies and North America. In the beginning he let blood; and in the first remission gave four or five grains of ipecacuanha, with from half a grain to two grains of emetic tartar. This powder he repeated in two hours, taking care that the patient should not drink before the second dose; for then the medicine more readily passed into the bowels after it had operated by vomiting. If after two hours more the operation either way was small, he gave a third dose, which commonly had a good effect in opening the first passages; and then the fever either went quite off, or intermitted in such a manner as to yield to the bark. On the continent, he found little difficulty after the intermission; but in the West Indies, unless he gave the bark upon the very first intermission, though imperfect, the fever was apt to assume a continued and dangerous form.

In the remitting fevers of hot countries, however, it must be observed, that the lancet must in all cases be much more sparingly used than in similar diseases of the colder regions; and we must also be sparing of venesection in those countries where the marsh effluvia are very strong and prevail much. For this reason Dr Lind of Haslar greatly condemns the practice of indiscriminate bleeding when people first arrive in hot climates. The first diseases indeed which occur in a voyage to the southward are for the most part of an inflammatory nature, and owing to a sudden transition from cold to hot weather. This occasions a fullness and distension of the vessels; whence all Europeans, on their first arrival under the tropic, bear evacuations much better than afterwards. The practice of indiscriminately bleeding, however, a number of the ship's company when they first come into a warm latitude, is by no means found to answer the purpose of a preventive. In such cases, indeed, as plainly indicate a plethoric disposition brought on by the heat, blood-letting is certainly useful. The signs of this are a pain and giddiness in the head; a heaviness and dulness of the eyes, which sometimes appear slightly inflamed: there is also commonly a sense of weight and fulness in the breast, the pulse at the same time being quick and oppressed.

But the case is quite different after a longer continuance of sultry weather, and when the constitution is in some measure habituated to the hot climate. For it is then observed, that the symptoms of inflammations in the bowels, even the most dangerous, are not near so severe in such climates as in cold countries; nor can the patients bear such large evacuations. The physician, however, must take care not to be misled by the apparent mildness of the symptoms: for he will find, notwithstanding such deceitful appearances, that the inflammation makes a more rapid progress in hot countries than in cold, suppurations and mortifications being much more suddenly formed; and that in general all acute distempers come sooner to a crisis in the warm southern than in colder regions. Hence it is an important rule of practice in those climates, to seize the most early opportunity, in the commencement of all threatening inflammations, to make frequent though not copious evacuations by blood-letting. For by delay the inflammation quickly passes from it first to its last or fatal stage; at least an imperfect crisis in such inflammatory fevers ensues, which fixes an obstruction in the viscera extremely difficult to remove.

It is indeed a general maxim with some physicians in the West Indies, that in most acute distempers bleeding in that country is prejudicial. This is founded upon a supposition that the crassamentum of the blood is thinned, and the solids greatly weakened, by the heat of the climate. It is therefore objected, that bleeding in such an habit of body weakens the powers of nature, and withdraws the strength which is requisite to support the patient until the crisis of the fever.

This reasoning is partly just; but, like all general maxims, will admit of exceptions. First with regard to sailors, it is to be remembered, that they are more exposed to quick vicissitudes of heat, cold, damps, and to various changes of the air and weather, than most of the other inhabitants of the Torrid Zone. Add to this, that their intemperance, and the excesses they are apt to fall into whenever it is in their power to commit them, render them more liable to inflammations than any other set of people. Hence their diseases require more plentiful evacuations than the land-inhabitants of those parts of the world, and generally they bear them better. But with regard to the natives of the country, or those who have remained long there, it must be proper to bleed them very sparingly, making a small allowance for the different seasons of the year, the temperature of the air, and the situation of the places where they reside. Thus, in some parts, even on the island of Jamaica, at particular seasons, the weather is cool; wherefore, in these places, and at such seasons, the inhabitants having their fibres more rigid, and a firmer crasis of their blood, bear venesection much better.

In cold countries the state of the air greatly assists in restoring the impaired spring of the fibres; whereas every thing almost in warm weather, such as heat, moisture, &c. concur to relax and weaken the habit of body. Thus we may daily see persons in Britain, after having suffered a most severe fit of sickness, recover their strength and spirits in a few days, and in a very short time their natural constitution. But the case is very different in the sultry regions of the Torrid Zone, or indeed in any part of the world where the heat of the season causes the mercury to stand for any length of time at the 77th degree and upward of Fahrenheit's thermometer. During such an excess of heat, debility after fevers is apt to remain with European constitutions for several months. In Jamaica, the convalescents are sent to the cool summits of the mountains; but a retreat to a more northern climate is often absolutely necessary to recover their wonted tone and vigour of body. It is a well-established observation, that the negroes and aborigines of the Torrid Zone cannot bear plentiful evacuations by the lancet. They commonly mix the most stimulating poignant spices with their ordinary light food, and this is found by experience suitable to their constitutions.

As proper preventives for the dangerous fevers of which

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which we are treating, Dr Lind on all occasions recommends the avoiding of stagnant water, or putrid marshes; the use of proper food, cleanliness, and sobriety. Of the propriety of removing from the neighbourhood of those places whose pestilential effluvia produce the disorders, we cannot possibly entertain a doubt; and of the efficacy of proper food in preventing putrid disorders he gives a remarkable instance in the Sheerness man of war, bound to the East Indies. As they went out, the men being apprehensive of sickness in so long a voyage, petitioned the captain not to oblige them to take up their salt provisions, but rather to permit them to live upon the other species of their allowance. It was therefore ordered, that they should be served with salt-meat only once a-week; and the consequence was, that, after a passage of five months and one day, the ship arrived at the Cape of Good Hope without having a single person sick on board. As the use of Sutton's pipes had been then newly introduced into the king's ships, the captain was willing to ascribe part of such an uncommon healthfulness to their beneficial effects; but it was soon discovered, that, by the neglect of the carpenter, the cock of the pipes had been all this while kept shut. This ship remained in India some months, where none of the men, except the boat's crew, had the benefit of going on shore; notwithstanding which, the crew continued to enjoy the most perfect state of health; they were, however, well supplied with fresh meat. On leaving India, knowing they were to stop at the Cape of Good Hope, and trusting to a quick passage, and the abundance of refreshments to be had there, they eat their full allowance of salt-meats, during a passage of only 10 weeks; and it is to be remarked the air-pipes were now open. The effect of this was, that when they were arrived at the Cape, 20 of them were afflicted in a most miserable manner with scorbutic and other disorders. These, however, were speedily recovered by the refreshments they met with on shore. Being now thoroughly sensible of the beneficial effects of eating, in these southern climates, as little salt meat as possible when at sea, they unanimously agreed, in their voyage home from the Cape, to refrain from their too plentiful allowance of salt flesh. And thus the Sheerness arrived at Spithead, with her full complement of 160 men in perfect health and with unbroken constitutions; having in this voyage of 14 months and 15 days buried but one man, who died in a mercurial salivation.

Thus we see, that a free and pure air is not a sufficient preservative against a putrescent state of the fluids, without proper food; and, on the other hand, we have a very remarkable instance of the inefficacy of the most salutary food to prevent putrid diseases, in a very noxious state of the atmosphere. In the year 1717, at the siege of Belgrade in Hungary, the fever of the country, and the flux, occasioned a most extraoadinary mortality among the troops. The dread of these diseases caused every one, as may naturally be supposed, to have recourse to different precautions for self-preservation. Prince Eugene, the commander in chief, had water and the provisions for his table sent him twice a-week from Vienna. The pure stream of the river Kahlenberg was regularly brought to him: he avoided all excesses, and lived regularly, or rather abstemiously; refreshed himself often by eating a cool melon; and mixed his usual wine, which was Burgundy, with water. Yet notwithstanding his utmost care, he was seized with a dysentery; which would have quickly put an end to his life, had not the speedy conclusion of that campaign permitted him to make a quick retreat.

Quartana.

At this unhealthy season, when hardly one imperial officer, much less their several domestics, escaped those malignant diseases, the renowned Count Bonneval and his numerous retinue continued in perfect health, to the surprise, or, to use the words of Dr Kramer, to the *envy*, of all who beheld him. The only precaution he used was to take, two or three times a-day, a small quantity of brandy in which the bark was infused; and he obliged all his attendants and domestics to follow his example. It is no less remarkable that the count, placing his certain preservation in the use of this single medicine, lived for many years afterwards in the most unhealthy spots of Hungary, without any attack or apprehension of disease; and continued to enjoy a perfect state of health during the hottest and most sickly seasons. And thus, with an unbroken and sound constitution, which is seldom the case of those who reside long in such climates, he lived to a great age. There is an instance produced by the same author of a whole regiment in Italy having been preserved by the use of the bark from the attack of these malignant diseases, viz. the flux, and *bilious* fever as it is frequently called, when the rest of the Austrian army, not pursuing that method, became greatly annoyed with them.

The intemperance and irregular living of those Europeans who visit the hot climates is frequently accused as the cause of their destruction; but, our author thinks, without sufficient reason: for though intemperance will make the body more liable to receive such diseases, it will not bring them on. It must by no means, however, be imagined, that in these climates Europeans may with impunity be guilty of excesses in eating or drinking; for the least error in that way will often prove fatal by debilitating the body, whose utmost strength in time of full health was perhaps scarce sufficient to resist the pestilential miasmata of the atmosphere.

It appears, therefore, from the concurrent testimony of the most eminent physicians, that the most proper medicine to be used, either as a preventive or cure for remitting and intermitting disorders is the Peruvian bark, administered with proper precautions, and after the *primæ viæ* have been evacuated of the putrid bilious matter collected in them. In those species of *tritæophya*, &c. belonging to this class, enumerated by Sauvages, the same remedies only were useful; but in that pestilential distemper which he calls *tritæophya Vratislaviensis*, he tells us, that washing the body with water sometimes hot sometimes cold, watery clysters, and plenty of aqueous drink, were likewise of use.

GENUS II. QUARTANA; the QUARTAN FEVER. 153

Quartana auctorum, *Sauv.* Gen. 89. *Lin.* 17. *Vog.* 3. *Sag.* 711. *Hoffm.* II. p. 23. *Junck.* tab. 81.

The *Genuine* QUARTAN. Sp. I. var. 1. A.

Quartana legitima, *Sauv.* sp. 1. *Sydenham* de morb. acut. cap. v.

Description.

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Description. The genuine quartan, according to Juncker, keeps its form more exactly than other intermittents; scarcely coming on at any other time than four or five in the afternoon. The cold is less violent than in the tertian; but is very perceptible, though it doth not proceed to such a height as to make the limbs shake; and continues for about two hours. It is preceded and accompanied by a langour both of body and mind. There is seldom any vomiting unless when the stomach is manifestly overloaded with aliment; neither is there any diarrhœa, but the belly in general is rather bound, not only on the days on which the paroxysm takes place, but also on the intermediate ones. The heat, which slowly succeeds the cold, is less troublesome to the patient by its violence than by the uneasy dryness of the skin, which is scarce ever moistened with sweat. This heat rarely continues longer than four or six hours, unless perhaps at the first or second paroxysm. It is accompanied also with a giddiness and dull pain of the head. On the termination of the paroxysm, the patient returns to a middling state of health, and continues in the same for the rest of the intermediate days; only there remains somewhat of a loathing, and a deep-seated pain as if the person was all over bruised or broken, which kind of sensation the physicians are wont to call *osteocopus*. The fit returns every fourth day, and that precisely at the same hours, being rarely postponed.

Causes of, and persons subject to, this disorder. The same general causes concur in producing this as in other intermittents, namely marsh miasmata, and whatever can dispose the body to be easily affected by them. Studious people, and those of a melancholic turn, are said to be particularly subject to quartans; but what are the immediate causes which produce a return of the fits every fourth day, instead of every day, or every third day, must probably lie for ever concealed, as depending upon the secret and inexplicable mechanism of the human body.

Prognosis. A simple quartan, where there is no reason to dread any induration of the viscera, may very certainly admit of a cure; and the prognosis can never be unfavourable, unless in cases of extreme weakness, or where the distemper hath been unskilfully treated.

Cure. This does not in the least differ from that which hath been fully laid down for the simple tertian, and which it is therefore needless to repeat here.

The *Duplicated* QUARTAN. Sp. I. var. 1. B.

154 Quartana duplicata, *Sauv.* sp. 4. *Bonet.*

This is entirely similar to the duplicated tertian already mentioned; proper allowance being made for the difference between the type of a tertian and quartan.

The *Triplicated* QUARTAN. Sp. I. var. 1. C.

155 Quartana triplicata, *Sauv.* sp. 16.

This hath three paroxysms every fourth day, while the intermediate days are entirely free from fever.

The *Double* QUARTAN. Sp. I. var. 1. D.

156 Quartana duplex, Sauv. sp. 3. *Vog.* sp. 13.

In the double quartan, the fits come on every day except the third; but so that the first paroxysm answers to the third, the second to the fourth, and so on.

The *Triple* QUARTAN. Sp. I. var. 1. E.

Quartana triplex, *Sauv.* sp. 5. *Vog.* sp. 14. *Bartholin.* H. anat. c. 1. 95. 157

This comes on every day, but the quartan type is still preserved by the times of accession; that is, the time of the fourth paroxysm's coming on answers to that of the first, the fifth to the second, the sixth to the third, &c.

The QUARTAN, accompanied with *Symptoms* of other diseases. Sp. I. var. 2.

Quartana cataleptica, *Sauv.* sp. 7. *Bonet.* polyalth. vol. 1. p. 805. 158

Quartana comatosa, *Sauv.* sp. 15. *Werholf.* de febr. *C. Pisonis* Observ. de morbis a colluvie seros. obs. 166, 167. 168, 169, 171, 172, 173, 174.

Quartana epileptica, *Sauv.* sp. 8. *Scholzii* Cons. 379, 380.

Quartana hysterica, *Sauv.* sp. 10. *Morton,* Pyret. exerc. 1. cap. ix. H. 10, 11.

Quartana nephralgica, *Sauv.* sp. 9.

Quartana metastatica, *Sauv.* sp. 17.

Quartana amens, *Sauv.* sp. 12. *Sydenham* de morb. acut. cap. v.

Quartana splenetica, *Sauv.* sp. 2. *Etmuller,* Coll. consult. cas 25.

The QUARTAN *complicated* with other *Diseases*. Sp. I. var. 3.

Quartana syphilitica, *Sauv.* sp. 6. *Plateri,* observ. L. III. p. 676. Edin. Ess. art. xlvii. obs. 8. 159

Quartana arthriticia, *Sauv.* sp. 11. *Musgr. de Arthr.* sympt. cap. ix. H. 4. et 5.

Arthritis febrisequa, *Sauv.* sp. 10.

Arthritis febricosa, *Sauv.* sp. 10. *Werlhols.* de febr. *Cockburn* de morbis navigantium, obs. 19.

Quartana scorbutica, *Sauv.* sp. 14. *Barthol.* de med. Dan. diss. iv. *Tim.* L. VIII. cas. 18.

The *Remitting* QUARTAN. Sp. II.

Tetartophya, *Sauv.* gen. 85. *Sag.* 699. *Lin.* 21. 160

Quartana remittens auctorum.

Var. 1. Tetartophya simplex, *Sauv.* sp 1.
2. Amphimerina semiquartana, *Sauv.* sp. 23.
3. Tetartophya semitertiana, *Sauv.* sp. 5.
4. Tetartophya maligna, *Sauv.* sp. 6. *Lautter.* Hist. med. cas. 21. *M. Donat.* L. III. cap. 14. ex *M. Gatenaria Horst.* L. I. obs. 15.
5. Tetartophya carotica, *Sauv.* sp. 4. *Werlholf.* de febr. *Bianchi* Hist. hep. pars III. const. ann. 1718, p. 751.
6. Tetartophya splenalgica, *Sauv.* sp. 2.
7. Tetartophya, hepatalgica, *Sauv.* 3. *Car. Pis.* in præfat. p. 33.
8. Amphimerina spasmodica, *Sauv.* sp. 16.

To the tertian or quartan fevers also belong the *Erraticæ* of authors. As all those above mentioned differ only in the slight circumstance of the type from the intermitting and remitting tertians already described at length, it is unnecessary here to take up time in describing every minute circumstance related by physicians concerning them, especially as it could contribute nothing towards the laying down a better method of cure than what hath been already suggested.

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GENUS III. QUOTIDIANA; the QUOTIDIAN FEVER.

Quotidiana auctorum, *Sauv.* gen. 86. *Lin.* 15. *Vog.* I. *Hoffm.* II. 33. *Junck.* tab. 79.

161 The *Genuine* QUOTIDIAN. Sp. I. var. I. A.
Quotidiana simplex, *Sauv.* sp. 1.
Quotidiana legitima, *Sennert.* de febr. cap. 18.

Description. This kind of fever generally comes on about six or seven o'clock in the morning, beginning with a considerable degree of cold and shivering, which lasts for about an hour; and is often accompanied with vomiting, or spontaneous diarrhœa, or both. It is succeeded by a pretty strong heat, accompanied with thirst, restlessness, and pain of the head. When the heat abates a little, a spontaneous sweat commonly follows, and the whole paroxysm rarely exceeds six hours. It returns, however, every day almost always at the same hour, unless it be evidently disturbed.

Causes of, and persons subject to, the disease. The same general causes are to be assigned for the quotidian as for other intermittents. This kind occurs but rarely; and is said to attack people of a phlegmatic temperament rather than any other: also old people rather than young, and women rather than men.

The prognosis and method of cure are not different from those of tertians and quartans.

The *Partial* QUOTIDIAN. Sp. I. var. I. B.

162 Quotidiana partialis, *Sauv.* sp. 16. *Cnoffel*, E N. C. D. I. A. III. obs. 205. Edin. Med. Eff. vol. i. art. 31. vol. ii. art. 16.
Quotidiana cephalalgica, *Sauv.* sp. 6. *Mort.* pyretol. exerc i. hist. 27. *Van Swieten in Boerh.* p. 534.
Cephalalgia intermittens, *Sauv.* sp. 7.
Cephalæa febricosa, *Sauv.* sp. 4.
Quotidiana ophthalmica, *Morton*, ibid. hist. 17. *Van Swieten*, ibid.
Ophthalmia febricosa, *Sauv.* sp. 23.

These distempers attack only some particular part of the body, as the head, the eye, arm, &c. producing periodical affections of those parts returning once in 24 hours; and are to be cured by the bark, as other intermittents. They are known to belong to this class, by the evident intermission of the pain or other affection of the part. The *quotidiana hysterica*, *Sauv.* sp. 3. *quotidiana catarrhalis*, *Sauv.* sp. 9, and *quotidiana stranguriosa*, *Sauv.* sp. 11. seem to be symptomatic disorders.

The *Remitting* QUOTIDIAN. Sp. II.

163 Amphimerina, *Sauv.* gen. 84. *Lin.* 20.
Quotidiana continua, *Vog.* 15.
Quotidianæ remittentes et continuæ auctorum.
Amphimerina latica, *Sauv.* sp. 1.
Febris continua lymphatica, *Etmuller*, Coll. consf. cas. 32. *River.* Obs. cent. 1. obs. 57.
Amphimerina singultuosa, *Sauv.* sp. 14.
Febris continua Lyngodes, *Vog.* 26.

Concerning these also nothing remains necessary to be mentioned in this place, having already so fully discussed the remitting fevers in all the different parts of the world. Many other varieties of these fevers mentioned by different authors are to be accounted merely symptomatic.

SECT. II. CONTINUED FEVERS.

Synocha.

Continuæ, *Sauv.* class ii. ord. 1. *Vog.* class I. ord. 2. *Sag.* 666. *Boerh.* 727.
Continentes, *Lin.* class. ii. ord. 1. *Stahl.* Cas. mag. 35. Cas. min. 87. *Junck.* 58. *Sennert.* de febr. L. ii. cap. 2. et 10.

GENUS IV. SYNOCHA.

Synocha, *Sauv.* gen. 80. *Lin.* 12. *Junck.* 58. 164
Synocha, sive febris acuta sanguinea, *Hoffm.* II. 105.
Synochus, *Vog.* 16.
Continua non putris, *Boerh.* 720.
Ephemera, *Sauv.* g. 79. *Boerh.* 728. *Junck.* 57.
Diaria, *Lin.* 11.
Febris inflammatoria auctorum.

Description. The most simple kind of synocha is the ephemera or diary fever. It begins without any sensation of cold or shivering, unless there be some internal inflammation, or the small-pox or measles happen to be present. A continual heat without any intermission constitutes the essence of this disease. The heat, however, is more tolerable than in the synocha properly so called. In some the pains of the head are pungent and throbbing, answering to the pulsations of the arteries; but in others they are dull and heavy. The face is red and bloated; and there is a remarkable lassitude of the limbs, with a strong, full, and frequent pulse. The urine is red, and deposits a sediment almost of the colour of orange-peel; and in the very first day of the disease, signs of concoction (according to the Hippocratic phrase) appear. The fever commonly goes off with a gentle sweat, but sometimes, though more rarely, with an hemorrhagy of the nose. Its shortest period is 24 hours; but if it goes beyond the fourth day, it is then a *synocha* properly so called.

The simple synocha, according to Vogel, begins with cold and shivering, succeeded by vehement heat, redness, and dryness of the skin. The face, especially, is very red, and the thirst intense. The head is either pained or heavy. The patient either doth not sleep at all, or is disturbed with dreams. A moist sweat then breaks out all over the skin. The pulse is full, quick, and frequent; the judgment is sometimes a little disturbed: young people are apt to be terrified with imaginations; and they for the most part incline to sleep: the respiration is difficult, and the belly costive; at the same time that a tensive kind of lassitude is perceived over the whole body. A complete crisis takes place either on the fourth or at the farthest on the eleventh day. The characteristic marks of the simple synochus, therefore, are, A redness of the face, moisture of the skin, a strong and frequent pulse.

Causes of, and persons subject to, this disease. As we have already remarked of intermittents, so must we also now remark of continued fevers, that it is impossible to discover those minute causes which occasion the difference of type betwixt one inflammatory fever and another, though most authors pretend to enumerate these with great certainty. Thus Juncker tells us, that the cause of the simple ephemera is plethora, together with any immoderate agitation and commotion of the fluids while in that state. Vogel reckons among the causes of his *febris diaria*, passions of the mind, pain, want, exposure to the sun, &c.; a repulsion or absorption

Febres of certain humours; wounds, fractures, luxations, &c.; so that in general we may reckon every thing tending to increase the action of the arterial system to be in certain circumstances a cause of inflammatory fever.— Hence we find those are most subject to the synocha whose constitution is either naturally robust, or who are exposed to those causes which tend to produce an increased action of the arterial system; such as hard labour, high living, &c.

Prognosis. The most simple kind of synocha, that is, the ephemera or diary fever, is commonly cured without the assistance of medicine, and therefore the prognosis is for the most part favourable: yet, if it be improperly treated by heating medicines, it may easily be converted into the other kind; or, if there be a putrid disposition of the fluids, into a fever of a very dangerous nature. The same thing is to be understood even of the most violent kind; for simple inflammatory fevers are not dangerous unless complicated with an affection of some particular part, as the pleura, stomach, &c.

Cure. Dr Cullen objects to the plan of those who are for leaving the cure of continued fevers to the operations of nature; because these operations are neither certain in themselves, nor are they so well understood as to enable us to regulate them properly; and it is likewise possible to supersede them by art. The plan therefore on which he proceeds is, to form his indications of cure upon the means of obviating the tendency to death in fevers; and these he reduces to three. 1. To moderate the violence of re-action.— 2 To remove or obviate the causes of debility; and, 3. To obviate or correct the tendency of the fluids to putrefaction.

The *first* indication may be answered, 1. By all those means which diminish the action of the heart and arteries. 2. By those which take of the spasm of the extreme vessels, which, according to his theory, is the chief cause of violent re-action.

I. The action of the heart and arteries may be diminished, 1. By avoiding or moderating those irritations which, in one degree or other, are almost constantly applied to the body. 2. By the use of certain sedative powers. 3. By diminishing the tension or tone of the arterial system.

[1.] The irritations above-mentioned are the impressions made upon our senses, the exercise of the body and mind, and the taking in of aliments. The avoiding of these as much as possible, or the moderating their force, makes what is properly called the *antiphlogistic regimen*, proper to be employed in *almost* every continued fever. This regimen is to be directed in the following manner.

1. Impressions on the external senses, as stimulant to the system, and a chief support of its activity, should be avoided as much as possible; especially such as are of a stronger kind, and which give pain and uneasiness. No impression is to be more carefully guarded against than that of external heat; and at the same time every other means of increasing the heat of the body is to be shunned. Both these precautions are to be taken as soon as a hot stage is fully formed, and to be attended to during its continuance, except in certain cases, where a determination to sweating is necessary, or where the stimulant effects of heat may be compensated by circumstances which determine it Synocha. to produce a relaxation and revulsion.

2. All motion of the body is to be avoided as much as possible, and that posture only chosen which employs the fewest muscles, and keeps none of them long in a state of contraction. Speaking, as it accelerates respiration, is particularly to be avoided. It must also be observed, that every motion of the body is more stimulant in proportion as the patient is weaker.

3. The exercise of the mind is also to be avoided, as being a stimulus to the body; but here an exception is to be made in the case of a delirium coming on, when the presenting of accustomed objects may divert the irregular train of ideas then arising in the mind.

4. The presence of recent aliment in the stomach proves always a stimulus to the system, and ought therefore to be as moderate as possible. A total abstinence for some time may be of service; but as this cannot be long continued with safety, we must avoid the stimulus of aliment by choosing that kind which gives the least. Alimentary matters are also to be accounted more stimulant in proportion to their alkalescent qualities; and this leads us to avoid all animal, and use only vegetable food. For the same reason, aromatic and spirituous liquors are to be avoided; and in answering the present indication, we must abstain from all fermented liquors except those of the lowest quality. Other stimuli are, the sensation of thirst, crudities or corrupted humours in the stomach, a preternatural retention of the fæces in the intestines, and a general acrimony of all the humours, which is in most fevers to be suspected. These are to be removed by such methods as the urgency of the symptoms require, by diluting liquors, vomiting, the use of acids, laxative clysters, and large quantities of antiseptic drinks.

[2.] The second method of moderating the violence of reaction is by the employment of certain sedative powers, with a view to diminish the activity of the whole body, and particularly that of the sanguiferous system. The first of these to be mentioned is the application of cold. Heat is the chief support of the activity of the animal-system; and the system is therefore provided with a power of generating heat in itself: but at the same time we may observe, that this would go to excess, were it not constantly moderated by a cooler temperature in the surrounding atmosphere. When, therefore, the generating power of heat in the system is increased, as is commonly the case in fevers, it is necessary not only to avoid all further means of increasing it, but also to apply air of a cooler temperature; or at least to apply it more entirely and freely than in a state of health. This is shown, from some late observations, to be a very powerful means of moderating the violence of reaction; but what is the mode of its operation, to what circumstances of fever it particularly applies, or what limitations it requires, are not yet fully ascertained.

Another sedative power very frequently employed in fevers, is that of certain medicines known in the materia medica by the name of *refrigerants*. The chief of these are acids of all kinds when sufficiently diluted, and which are, in several respects, remedies adapted to continued fevers. Those especially in use are

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are the vitriolic and vegetable; and on many accounts the latter are to be preferred. Another set of refrigerants are the neutral salts formed of the vitriolic, nitrous, or vegetable acids, with alkalies either fixed or volatile. All these neutrals, while they are dissolved in water, generate cold; but as that cold ceases soon after the dissolution is finished, and as the salts are generally exhibited in a dissolved state, their refrigerant power in the animal body does not all depend upon their power of generating cold with water. Nitre is the refrigerant chiefly employed; but all the others, compounded as above mentioned, partake more or less of the same quality. Besides these neutrals, some metallic salts have also been employed in fevers, particularly the sugar of lead: but the refrigerant powers of this salt are by no means ascertained, and its deliterious qualities are too well known to admit of its being freely used.

[3.] The third general method of diminishing the reaction of the system, is by lessening the tension, tone, and activity of the sanguiferous system. As the activity of the system in a great measure depends upon the tone, and this again upon the tension, of the vessels, given to them by the quantity of fluids they contain, it is evident, that the diminution of the quantity of these must diminish the activity of the sanguiferous system. The most efficacious means of diminishing the quantity of fluids is by the evacuations of blood-letting and purging. The former is evidently one of the most powerful means of diminishing the activity of the whole body, and especially of the sanguiferous system; and it must therefore be the most effectual means of moderating the reaction in fevers. When the violence of reaction, and its constant attendant a phlogistic diathesis, are sufficiently evident; when these constitute the principal part of the disease, and may be expected to continue through the whole of it, as in the cases of synocha; then blood-letting is the principal remedy, and may be employed as far as the symptoms of the disease may seem to require, and the constitution of the patient will bear. It must, however, be remarked, that a greater evacuation than is necessary may occasion a slower recovery, and render the person more liable to a relapse, or bring on other diseases. It is also to be observed, that this evacuation is the more effectual, as the blood is more suddenly drawn off, and as the body is at the same time more free from all irritation, and therefore when it is in a posture in which the fewest muscles are in action.

With regard to purging, when we consider the quantity of fluids constantly present in the cavity of the intestines, and the quantity which may be drawn off from the innumerable excretories that open into this cavity, it will be obvious, that a very great evacuation may be made in this way; and if this be done by a stimulus that is not at the same time communicated to the rest of the body, it may, by emptying both the cavity of the intestines and the arteries which furnish the excretions poured into it, induce a considerable relaxation in the whole system; and is therefore suited to moderate the violence of reaction in fevers. But it is to be observed, that as the fluid drawn from the excretories opening into the intestines is not all drawn immediately from the arteries, and as what is even more immediately drawn from these is drawn off slowly; so the evacuation will not, in proportion to its quantity, occasion such a sudden depletion of the red vessels as blood-letting does; and therefore cannot act so powerfully in taking off the phlogistic diathesis of the system.

At the same time the evacuation may induce a considerable degree of debility; and therefore, in those cases in which a dangerous state of debility is likely to occur, purging is to be employed with a great deal of caution; and this caution is more difficult to be observed than in the case of blood-letting: and it is further to be noticed, that as purging takes off in some measure the determination of the blood to the vessels on the surface of the body, it seems to be an evacuation not well adapted to the cure of fevers.

II. The other method of moderating the violence of reaction in fevers is by the exhibition of those remedies suited to take off the spasm of the extreme vessels, supposed to be the irritation which chiefly supports the reaction. The means to be employed for this purpose are either internal or external.

First, The internal means are, 1. Those which determine the force of the circulation to the extreme vessels on the surface of the body, and, by restoring the tone and activity of these vessels, overcome the spasm on their extremities. 2. Those medicines which have the power of taking off spasm in any part of the system, and which are known under the title of ANTISPASMODICS.

(1.) Those remedies which are fit to determine to the surface of the body are, 1. Diluents. 2. Neutral salts. 3. Sudorifics. 4. Emetics.

1. Water enters, in a large proportion, into the composition of all the animal fluids, and a large quantity of it is always diffused through the whole of the common mass. In a sound state, the fluidity of the whole mass depends upon the quantity of water present in it. Water therefore is the proper diluent of our mass of blood, and other fluids are diluent only in proportion to the quantity of water they contain.

In a healthy state, also, the fulness of the extreme vessels and the quantity of excretion are in proportion to the quantity of water present in the body. But in fever, though the excretions be in some measure interrupted, they continue in such quantity as to exhale the more fluid parts of the blood; and, while a portion of them is at the same time necessarily retained in the larger vessels, the smaller, and the extreme vessels, both from the deficiency of fluid and their own contracted state, are less filled, and therefore allowed to remain in that condition. To remedy this contracted state, nothing is more necessary than a large supply of water or watery fluids taken in by drinking or otherwise; for as any superfluous quantity of water is forced off by the several excretories, such a force applied may be a means of dilating the extreme vessels, and of overcoming the spasm affecting their extremities. Accordingly, the throwing in of a large quantity of watery fluids has been, at all times, a remedy much employed in fevers; and in no instance more remarkably than by the Spanish and Italian physicians, in the use of what they call the *diæta aquea*. This practice consists in taking away every other kind of aliment and drink, and in giving, in divided portions, every day for several days together, six or eight pounds of plain water, generally cold, but sometimes warm. All this, however, is to be done only after the disease has continued for some time, and at least for a week.

2. A second means of determining to the surface of the body, is by the use of neutral salts. These neutrals, in a certain dose, taken into the stomach, produce soon after a sense of heat upon the surface of the body; and, if the body be covered close and kept warm, a sweat is readily brought out. The same medicines taken during the cold stage of a fever, very often put an end to it, and bring on the hot one; and they are also remarkable for stopping the vomiting which so frequently attends the cold stage of fevers. All this shows, that neutral salts have a power of determining the blood to the surface of the body, and may therefore be of use in taking off the spasm which subsists there in fevers. The neutral most commonly employed in fevers, is that formed of an alkali with the native acid of vegetables. But all the other neutrals have more or less of the same virtue; and perhaps some of them, particularly the ammoniacal salts, possess it in a stronger degree. As cold water taken into the stomach often shows the same diaphoretic effects with the neutral salts, it is probable that the effect of the latter depends upon their refrigerant powers.

3. A third method of determining to the surface of the body, and taking off the spasm subsisting there, is by the use of sudorifics and of sweating. The propriety of this remedy has been much disputed; and many specious arguments may be adduced both for and against the practice. In its favour may be urged, 1. That in healthy persons, in every case of increased action of the heart and arteries, a sweating takes place, and is, seemingly, the means of preventing the bad effects of such increased action. 2. That, in fevers, their most usual solution and termination is by spontaneous sweating. 3. That, even when excited by art, is has been found useful at certain periods, and in certain species of fever.—On the other hand, it may be urged against the practice of sweating, 1. That in fevers, as a spontaneous sweating does not immediately come on, there are some circumstances different from those in the state of health, and which may render it doubtful whether the sweating can be safely excited by art. 2. That in many cases the practice has been attended with bad consequences. The means commonly employed have a tendency to produce an inflammatory diathesis; which, if not taken off by the sweat succeeding, must be increased with much danger. Thus sweating employed to prevent the accessions of intermitting fevers has often changed them into a continued form, which is always dangerous. 3. The utility of the practice is doubtful, as sweating, when it happens, does not always give a final determination, as must be manifest in the case of intermittents, and in many continued fevers which are sometimes in the beginning attended with sweatings which do not prove final; and, on the contrary, whether they be spontaneous or excited by art, they seem often to aggravate the disease.

From these considerations, it is doubtful if the practice of sweating can be admitted very generally; but, at the same time, it is also very doubtful if the failure of the practice, or the mischiefs said to arise from it, have not been owing to the improper conduct of the practitioner. With respect to the last, it is almost agreed among physicians, 1. That sweating has been generally hurtful when excited by stimulant, heating, and inflammatory medicines. 2. That it has been hurtful when excited by much external heat, and continued with a great increase of the heat of the body. 3. That it is always hurtful when it does not relieve; and rather increases the frequency and hardness of the pulse, the anxiety and difficulty of breathing, the headach, and delirium. 4. That it is always hurtful if it be urged when the sweat is not fluid, and when it is partial and on the superior parts of the body only.

In these cases, it is probable, that either an inflammatory diathesis is produced, which increases the spasm on the extreme vessels; or that, from other causes, the spasm is too much fixed to yield easily to the increased action of the heart and arteries; and upon either supposition it must be obvious, that urging the sweat may produce determinations to some of the internal parts, with very great danger.

Notwithstanding these doubts, however, it still remains true, 1. That sweating has been often useful in preventing the accessions of fevers when they have been certainly foreseen, and a proper conduct employed. 2. That even after fevers have in some measure come on, sweating has interrupted their progress when properly employed, either at the very beginning of the disease, or during its approach and gradual formation. 3. That even after pyrexiæ have continued for some time, sweating has been successfully employed in curing them, as is particularly exemplified in the case of a rheumatism. 4. That certain fevers produced by a very powerful sedative contagion, have been generally treated most successfully by sweating.

These instances are in favour of sweating, but give no general rule; and it must be left to farther experience to determine how far any general rule can be established in this matter. In the mean time, if the practice of sweating is to be attempted, the following rules may be laid down for the conduct of it 1. That a sweat should be excited without the use of stimulant inflammatory medicines. 2. That it should be excited with as little external heat, and with as little increase of the heat of the body, as possible. 3. That, when excited, it should be continued for a due length of time; not less than 12 hours, and sometimes for 24 or 48 hours; always, however, supposing that it proceeds without the dangerous circumstances already mentioned. 4. That for some part of the time, and as long as the person can easily bear, it should be carried on without admitting of sleep. 5. That it should be rendered universal over the whole body; and therefore particularly that care should be taken to bring the sweating to the lower extremities. 6. That the practice should be rendered safer by moderate purging excited at the same time. 7. That it should not be suddenly checked by cold any how applied to the body.

When attention is to be given to these rules, the sweating may be excited, 1. By warm bathing, or a fomentation of the lower extremities. 2. By frequent draughts of tepid liquors, chiefly water, rendered more grateful

grateful by the addition of a light aromatic, or more powerful by that of a fmall quantity of wine. 3. By giving fome dofes of neutral falts. 4. Moft effectually, and perhaps moft fafely, by a large dofe of an opiate, joined with a portion of neutral-falts, and of an emetic.

The fourth mean of determining to the furface of the body, and thereby taking off the fpafm affecting the extreme veffels, is by the ufe of emetics. Thefe, particularly of the antimonial kind, have been employed in the cure of fevers ever fince the introduction of chemical medicines; and though of late their ufe has become very general, their efficacy is ftill difputed, and their manner of operating is differently explained.

Vomiting is in many refpects ufeful in fevers; as it evacuates the contents of the ftomach, as it emulges the biliary and pancreatic ducts, and evacuates the contents of the duodenum, and perhaps alfo of a larger portion of the inteftines; as it agitates the whole of the abdominal vifcera, it expedes the circulation in them, and promotes their feveral fecretions; and laftly, as it agitates alfo the vifcera of the thorax, it has like effects there.

It is not to this caufe, however, that we are to impute the effect vomiting has in determining to the furface of the body. This muft be attributed to the particular operation of emetics upon the mufcular fibres of the ftomach, whereby they excite the action of the extreme arteries on the furface of the body, and by this means effectually determine the blood to thefe veffels, remove the atony, and take off the fpafm affecting them. For this purpofe they are exhibited in two different ways; that is, either in fuch dofes as may excite full and repeated vomitings, or in fuch dofes as may excite ficknefs and naufea only, with little or no vomiting at all.

Full vomiting is well fuited to determine to the furface of the body, and thereby to obviate the atony and fpafm which lay the foundation of fever. Thus, vomiting excited a little before the expected acceffion of the paroxyfm of an intermittent, has been found to prevent the paroxyfm altogether. It has been obferved alfo, that when contagion has been applied to a perfon, and firft difcovers its operation, a vomit given has prevented the fever which might otherwife have been expected.

Thefe are the advantages to be obtained by exciting vomiting at the firft approach of fevers, or of the paroxyfm of fevers; and they may alfo be applied after fevers are formed, to take off, perhaps entirely, the atony and fpafm, or at leaft to moderate thefe, fo that the fever may proceed more gently and fafely. It is feldom, however, that vomiting is found to produce a final folution of fevers; and after they are once formed, it is commonly neceffary to repeat the vomiting feveral times; but this is attended with inconveniency, and fometimes with difadvantage. The operation of full vomiting is tranfitory, and the exercife of vomiting is a debilitating power; and therefore, when the vomiting does not remove the atony and fpafm very entirely, it may give occafion to their recurrence with greater force. For thefe reafons, after fevers are fully formed, fome phyficians have thought proper to employ emetics in naufeating dofes only. Thefe are capable of exciting the action of the extreme veffels, and their operation is more permanent. At the fame time they often fhow their power by exciting fome degree of fweat, and their operation is rendered more fafe by their commonly producing fome evacuation by ftool. But naufea continued for any great length of time, is to moft patients a fenfation highly diftreffing, and almoft infufferable.

The emetics chiefly in ufe at prefent are, ipecacuanha and antimony. The former may be employed for determining to the furface of the body: but, even in very fmall dofes, it fo readily excites vomiting, that it is with difficulty employed for the purpofe of naufeating only; and in whatever manner employed, there is reafon to fufpect that its effects are lefs permanent, and lefs powerfully communicated from the ftomach to the reft of the fyftem, than thofe of antimony. This laft is therefore generally preferred; and its preparations, feemingly various, may all be reduced to two heads; one comprehending thofe in which the reguline part is in a condition to be acted upon by acids, and therefore on meeting with acids in the ftomach it becomes active; and another, comprehending thofe preparations in which the reguline part is already joined with an acid, rendering it active. Of each kind there are great numbers, but not differing effentially from one another; the two moft worthy of notice are, the *calx nitrata antimonii* and *emetic tartar*, or *antimonium tartarifatum*, of the Edinburgh difpenfatory. Both thefe are very efficacious medicines; but the latter feems preferable, becaufe its dofe is capable of being better afcertained; though the former, on account of its flower operation, may have fome advantages, and in certain cafes be more efficacious as a purgative and fudorific.

The *calx nitrata antimonii*, when firft introduced into the pharmacopœia of the Edinburgh college, was fuppofed to be very nearly, if not precifely, the fame with a medicine which has of late been highly celebrated in the cure of fevers, Dr James's powder. But from later and more accurate obfervations, there is now reafon to believe that the pulvis antimonialis of the London pharmacopœia, formed by the calcination of antimony with hartfhorn, approaches more nearly to that celebrated arcanum. But at any rate, the calx antimonii nitrata, the pulvis antimonialis, and James's powder, are probably not effentially different from each other. The two latter, however, have the moft near refemblance; and accordingly the Edinburgh college in the laft edition of their pharmacopœia have introduced an article under the title of *antimonium calcareo-phofphoratum*, which they confider as fo much fimilar to James's powder, that they have ufed as a fynonyme for it, the title of *pulvis Jacobi*.

The time moft proper for exhibiting thefe medicines is a little before the acceffion, when that can be certainly known. In continued fevers the exacerbations are not always very obfervable; but there is reafon to believe, that one commonly happens about noon or foon after it; and that thefe, therefore, are the moft proper times for exhibiting emetics.

With refpect to the manner of adminiftration, that of the *calx nitrata* is fimple, as the whole of what is thought a proper dofe may be given at once; and no more can be properly given till the next acceffion. The adminiftration of the emetic tartar is different. It is to be given in fmall dofes, not fufficient to excite vomiting;

Fibres miting; and these doses are to be repeated after short intervals for several times, till sickness, nausea, and some, though not much, vomiting come on. The difference of administration must depend upon the dose, and the length of the interval at which it is given. If it be intended that the medicine should certainly operate by stool, the doses are made small, and the intervals long. On the contrary, when vomiting is proper, or when much purging ought to be avoided, and therefore some vomiting must be admitted, the doses are made larger, and the intervals shorter. With respect to both kinds of preparations, the repetition is to be made at the times of accession, but not very often: for if the first exhibitions, duly managed, have little effect, it is seldom that the after exhibitions have much; and it sometimes happens that the repeated vomiting, and especially repeated purging, does harm by weakening the patient.

(2.) The other set of internal medicines which are supposed useful in taking off the spasm of the extreme vessels, are those named *antispasmodic*. But whatever may be the virtues of some of them in this way, such is their power of stimulating at the same time, that very few of them can with safety be administered in fevers of an inflammatory nature. Almost the only one which can with safety be exhibited in these cases is camphor; and the operations of this are by no means well ascertained. Dr Huxham mentions it as a corrector of the acrimony of cantharides; and assures us, that it very effectually promotes a diaphoresis. But from the remarks of other practitioners, we have no just reason to suppose that it acts perceptibly in a dose of five or six grains, though in 15 or 20 it produces a particular kind of intoxication.

Secondly, The external means suited to take off the spasm of the extreme vessels, are blistering and warm bathing.

1. What are the effects of blistering so frequently employed in fevers, is not yet agreed upon among physicians. Dr Cullen is of opinion, that the small quantity of cantharides absorbed from a blistering plaster, is not sufficient to change the consistence of the mass of blood; and therefore, that such a quantity can neither do good by resolving phlogistic lentor if it exists, nor do harm by increasing the dissolution of the blood arising from a putrid tendency in it. The effects of cantharides upon the fluids, therefore, may be entirely neglected. The inflammation produced by the application of cantharides to the skin, affords a certain proof of their stimulant power: but in many persons the effect of that stimulus is not considerable; in many it is not communicated to the whole system; and even when it does take place in the whole system, it seems to be taken off very entirely by the effusion and evacuation of serum from the blistered part. It may be concluded, therefore, that neither much good is to be expected, nor much harm to be apprehended, from the stimulant power of blistering; and the certainty of this conclusion is established by the great benefit arising from the proper practice of blistering in inflammatory diseases. Much has been imputed to the evacuation made by blistering; but it is never so considerable as to affect the whole system; and therefore can neither by a sudden depletion relax the sanguiferous system, nor by any revulsion affect the general distribution of the fluids. The evacuation, however, is so considerable as to affect the neighbouring vessels; and the manifest utility of blistering near the part affected in inflammatory diseases leads us to think, that blistering, by deriving to the skin, and producing an effusion there, relaxes the spasm of the deeper seated vessels. It is in this manner, most probably, that the tumor of a joint, from an effusion into the cellular texture under the skin, takes off the rheumatic pain formerly affecting that joint. Analogous to this, probably, is the good effect of blistering in continued fevers; and arises from the relaxation of the spasm of the extreme vessels by a communication of the blistered part with the rest of the skin. A blister may be employed at any period in continued fevers; but it will be of most advantage in the advanced state of such fevers, when, the reaction being weaker, all ambiguity from the stimulating power of blistering is removed, and when it may best concur with other circumstances tending to a final solution of the spasm. Typhus.

From this view of the matter, it will appear, that the part of the body to which blisters ought to be applied is indifferent, except upon the suspicion of topical affection, when the blistering is to be made as near as possible to the part affected. Whether sinapisms and other *rubefacientia* act in a manner analogous to what has been supposed of blistering may be doubtful; but their effects in rheumatism and other inflammatory diseases render it probable.

2. The other external means of taking off the spasm of the extreme vessels is warm bathing. This was frequently, and in different circumstances, employed by the ancients; but has, till very lately, been neglected by modern physicians. As the heat of the bath stimulates the extreme vessels, and, with the concurrence of moisture, also relaxes them, it seems to be a safe stimulus, and well suited to take off the spasm affecting these vessels. It may be applied to the whole body by immersion; but this is in many respects inconvenient; and whether some of the inconveniences of immersion might not be avoided by a vapour-bath, is not yet determined by experience; but from extensive experience it appears, that most of the purposes of warm bathing can be obtained by a fomentation of the legs and feet, if properly administered, and continued for a due length of time, not less than an hour. The marks of the good effects of such a fomentation are, the patient's bearing it easily, its relieving delirium, and inducing sleep.

GENUS V. TYPHUS; the *Typhous Fever*.

Typhus, *Sauv.* Gen. 82. *Sag.* 677. 165

I. Typhus mitior, or the *Slow Nervous Fever*. Sp. I. var. 1. 166

Febris maligna hectica convulsiva, sive lues ... *Willis*, de morb. convulsiv. cap. 8.

Febris pestilens, *Fracastor.* de morb. contag. L. II. cap. 4.

Febris pestilens sine charactere veneni, *Forest*, L. VI. obs 26.

Febris hectica pestilens, *Forest*, L. VI. obs. 32.

Febris nova ann. 1685, *Sydenham*, Sched. monitor.

Febris putrida nervosa, *Wintringh.* Com. Nosolog. ad ann. 1720, 1721.

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Febris lenta nervofa, *Huxham* on fevers, chap. 8.

Febris contagiofa, *Lind* on fevers and infection, *passim*.

Typhus nervofus, *Sauv.* fp. 2.

Typhus comatofus, *Sauv.* fp. 3.

Tritæophya typhodes Mangeti, *Sauv.* fp. 11. *Raym. Fort.* de febribus.

Defcription. Of all the defcriptions we have of the nervous fever, that of Dr Huxham is perhaps the beft. According to him, the patient at firft grows fomewhat liftlefs, and feels flight chills and fhudders, with uncertain flufhes of heat, and a kind of wearinefs all over, like what is felt after great fatigue. This is always attended with a fort of heavinefs and dejection of fpirit, and more or lefs of a load, pain, or giddinefs of the head; a naufea and difrelifh of every thing foon follows, without any confiderable thirft, but frequently with urging to vomit, though little but infipid phlegm is brought up. Though a kind of lucid interval of feveral hours fometimes intervenes, yet the fymptoms return with aggravation, efpecially towards night; the head grows more giddy or heavy; the heat greater; the pulfe quicker, but weak; with an oppreffive kind of breathing. A great torpor, or obtufe pain and coldnefs, affects the hinder-part of the head frequently, and oftentimes a heavy pain is felt on the top all along the *coronary future*; this, and that of the back-part of the head, generally attend nervous fevers, and are commonly fucceeded by fome degree of a delirium. In this condition the patient often continues for five or fix days, with a heavy, pale, funk countenance; feemingly not very fick, and yet far from being well; reftlefs, anxious, and commonly quite void of fleep, though fometimes very drowfy and heavy; but although he appears to thofe about him actually to fleep, he is utterly infenfible of it, and denies that he doth fo. The pulfe during all this time is quick, weak, and unequal: fometimes fluttering, and fometimes for a few moments flow; nay, even intermitting, and then, with a fudden flufh in the face, immediately very quick, and perhaps foon after furprifingly calm and equal; and thus alternately. The heats and chills are as uncertain and unequal; fometimes a fudden colour and glow arife in the cheeks, while the tip of the nofe and ears is cold, and the forehead at the fame time in a cold dewy fweat. Nay, it is very common, that a high colour and heat appear in the face, when the extremities are quite cold. The urine is commonly pale, and often limpid; frequently of a whey colour, or like vapid fmall-beer, in which there is either no manner of fediment, or a kind of loofe matter like bran irregularly fcattered up and down in it. The tongue at the beginning is feldom or never dry or difcoloured, but fometimes covered with a thin whitifh mucus: at length, indeed, it often appears very dry, red, and chapped, or of the colour of pomegranate-rind; but this moftly at the clofe of the difeafe: yet, however dry the tongue and lips feem, the patient fcarce ever complains of thirft, though fometimes of a heat in the tongue. About the feventh or eighth day, the giddinefs, pain, or heavinefs of the head become much greater, with a conftant noife in it, or *tinnitus aurium*; which is very difturbing to the fick, and frequently brings on a delirium. The load on the præcordia, anxiety and faintnefs, grow much more urgent; and they often fall into an actual deliquium, efpecially if they attempt to fit up; cold fweats fuddenly come out on the forehead, and on the backs of the hands (though at the fame time there is too much heat in the cheeks and palms), and as fuddenly go off. If the urine now grows more pale and limpid, a delirium is certainly to be expected, with univerfal tremors and *fubfultus tendinum*; the delirium is feldom violent, but as it were a confufion of thought and action, muttering continually to themfelves, and faltering in their fpeech Sometimes they awake only in a hurry and confufion, and prefently recollect themfelves, but forthwith fall into a muttering dozy ftate again. The tongue grows often very dry at the height, efpecially in its middle part, with a yellowifh lift on each fide, and trembles greatly when the fick attempts to put it out. Frequently profufe fweats pour forth all at once, about the ninth, tenth, or twelfth day, commonly coldifh and clammy on the extremities; oftentimes very thin ftools are difcharged, and then nature finks apace; the extremities grow cold, the nails pale or livid; the pulfe may be faid to tremble and flutter, rather than to beat, the vibrations being fo exceeding weak and quick that they can fcarce be diftinguifhed; though fometimes they creep on furprifingly flow, and very frequently intermit. The fick become quite infenfible and ftupid, fcarce affected with the loudeft noife or the ftrongeft light; though, at the beginning, ftrangely fufceptible of the impreffions of either. The delirium now ends in a profound coma, and that foon in eternal fleep. The ftools, urine, and tears, run off involuntarily, and denounce a fpeedy diffolution, as the vaft tremblings and twitchings of the nerves and tendons are preludes to a general convulfion, which at once fnaps off the thread of life. In one or other of thefe ways are the fick carried off, after having languifhed for 14, 18, or 20 days; nay, fometimes much longer. Moft patients grow deaf and ftupid towards the end of this difeafe, (fome extremely deaf), though too quick and apprehenfive at the beginning; infomuch that the leaft noife or light greatly offended them. Many from their immoderate fears feem to hurry themfelves out of life, where little danger is apparent at the beginning: nay, fome will not allow themfelves to fleep, from a vain fear of dozing quite away; and others from the vaft hurry, anxiety, and confufion they are fenfible of either during fleep or at their waking.

Typhus.

Caufes of, and perfons fubject to, the diforder. The nervous fever is moft frequently the confequence of contagion. It moft commonly attacks perfons of weak nerves, a lax habit of body, and a poor thin blood; thofe who have fuffered great evacuations, a long dejection of fpirits, immoderate watchings, ftudies, fatigue, &c.; alfo thofe who have ufed much crude unwholefome food, vapid impure drinks, or who have been confined long in damp foul air; who have broken the vigour of their conftitutions by falivations, too frequent purging, immoderate venery, &c. Hence we fee how the difeafe is connected with an extreme debility of the nervous fyftem; for, when people are prepared for this fever by having their nerves already weakened, the contagious particles immediately attack the nervous fyftem, without

out so much affecting the state of the blood or juices, though the latter are greatly affected in the putrid malignant fevers.

Prognosis. In nervous fevers, the prognosis is very much the same with that of the putrid malignant kind. And although death be not so frequent as in that modification of fever, yet it may justly be considered as a very fatal disease.

Cure. As this fever is produced by a contagion affecting the nervous system of a person already debilitated, and thus producing weakness in an extreme degree, we have now occasion to consider Dr Cullen's *two indications* of cure omitted under the *Synocha;* namely, to remove the cause and obviate the effects of debility, and to correct the putrescent tendency of the fluids; for though, in the beginning of nervous fevers, the tendency to putrefaction be not remarkable, it becomes exceedingly great towards their conclusion.

[1.] In answering the first indication, Dr Cullen observes, that most of the sedative powers inducing debility cease to act soon after they have been first applied; and therefore the removing them is not an object of the present indication. There is only one which may be supposed to continue to act for a long time, and that is the contagion applied; but we know nothing in the nature of contagion that can lead us to any measures for removing or correcting it. We know only its effects as a sedative power inducing debility, or as a ferment inducing a tendency to putrefaction in the fluids, the former of which at present falls under our consideration.—The debility induced in fevers by contagion, or other causes, appears especially in the weaker energy of the brain; but in what this consists, or how it may be restored, we do not well know; but as nature, seemingly for this purpose, excites the motion of the heart and arteries, we must ascribe the continuance of the debility to the weaker re-action of the sanguiferous system: the means, therefore, which we employ for obviating debility, are immediately directed to support and increase the action of the heart and arteries; and the remedies employed are tonics or stimulants.

In contagious diseases we know, both from the effects which appear, and from dissections, that the tone of the heart and arteries is considerably diminished; and that tonic remedies are therefore properly indicated. We are to consider these remedies as of two kinds; 1. The power of cold; 2. That of tonic medicines.

The power of cold as a tonic in fevers may be employed in two ways: either as thrown into the stomach, or as applied to the surface of the body. As we have already observed that the power of cold may be communicated from any one part to every other part of the system, so it will be readily allowed that the stomach is a part as fit as any other for this communication, and that cold drink taken into the stomach may prove an useful tonic in fevers.—This the experience of all ages has confirmed; but at the same time it has been frequently observed, that, in certain circumstances, cold drink taken into the stomach has proved very hurtful; and therefore that its use in fevers requires some limitations. What these limitations should be, and what are all the circumstances which may forbid the use of cold drink, it is difficult to determine; but it seems clearly forbidden in all cases where a phlogistic diathesis prevails in the system, and more especially when there are topical affections of an inflammatory nature.

The other method of employing cold as a tonic, is by applying it to the surface of the body, as a refrigerant power fit to moderate the violence of reaction; but probably it may here also be considered properly as a tonic, and useful in cases of debility.—Not only cool air, but cold water also may be applied to the surface of the body as a tonic. The ancients frequently applied it with advantage to particular parts as a tonic; but it is a discovery of modern times, that, in the case of putrid fevers attended with much debility, the body may be washed all over with cold water. This was first practised at Breslaw in Silesia, as appears from a dissertation under the title of *Epidemia Verna, quæ Wratislaviam anno* 1737 *afflixit*, to be found in the *Acta Nat. Curios.* vol. x. And from other writers it appears, that the practice has passed into some of the neighbouring countries; but in this island it does not appear that we have yet had any experience of it.

The medicines which have been employed in fevers as tonics are various. If the *saccharum saturni* hath been found useful, it is probably as a tonic rather than as a refrigerant; and the *ens veneris*, or other preparations of iron which have been employed, can act as tonics only. The preparations of copper, from their effects in epilepsy, are presumed to possess a tonic power; but whether their use in fevers be founded on their tonic or emetic powers, is uncertain. And upon the whole there may no doubt occur some instances of fevers being cured by tonics taken from the fossile kingdom; but the vegetable tonics are the most efficacious, and among these the Peruvian bark certainly holds the first place.

The bark has commonly been considered as a specific, or a remedy of which the operation was not understood. We must observe, however, that, as in many cases the effects of the bark are perceived soon after its being taken into the stomach, and before it can possibly be conveyed to the mass of blood, we may conclude, that its effects do not arise from its operating on the fluids; and must therefore depend upon its operating on the nerves of the stomach, and being thereby communicated to the rest of the nervous system. This operation seems to be a tonic power, the bark being a remedy in many cases of debility, particularly in gangrene: and if its operation may be explained from its possessing a tonic power, we may easily perceive why it is improper when a phlogistic diathesis prevails; and from the same view we can ascertain in what cases of continued fever it may be admitted. These cases are either where considerable remissions have appeared, when it may be employed to prevent the return of exacerbations, on the same footing as it is used in intermitting fevers; or in the advanced state of fevers, when all suspicion of an inflammatory state is removed, and a general debility prevails in the system; and its being then employed is sufficiently agreeable to the present practice.

Another set of medicines to be employed for obviating debility and its effects, are the direct stimulants.

Febres lants. These, in some measure, increase the tone of the moving fibres; but are different from the tonics, as they more directly excite and increase the action of the heart and arteries. This mode of their operation renders their use ambiguous; and when an inflammatory diathesis is present, the effects of the stimulants may be very hurtful; but it is still probable, that in the advanced state of these fevers, when debility prevails, they may be useful.

Of all the stimulants which may be properly employed, wine seems to be the most eligible. It has the advantage of being grateful to the palate and stomach, and of having its stimulant parts so much diluted, that it can be conveniently given in small doses; and therefore it may be employed with sufficient caution; but it is of little service unless taken pretty largely.—It may be suspected that wine has an operation analogous to that of opium; and on good grounds. But we can distinctly remark its stimulant power only; which renders its effects in the phrenitic delirium manifestly hurtful; and in the mild delirium depending on debility, as remarkably useful.

[2.] We must now proceed to the other indication of cure, namely, to correct or obviate the tendency in the fluids to putrefaction. This may be done, 1. By avoiding any new application of putrid or putrescent matter. 2. By evacuating the putrid or putrescent matter already present in the body. 3. By correcting the putrid or putrescent matter remaining in the body by diluents and antiseptics. 4. By supporting the tone of the vessels, and thereby resisting further putrefaction, or obviating its effects. 5. By moderating the violence of re-action, considered as a means of increasing putrefaction.

The further application of putrid or putrescent matter may be avoided, 1. By removing the patient from places filled with corrupted air. 2. By preventing the accumulation of the patient's own effluvia, by a constant ventilation, and by a frequent change of bed-clothes and body-linen. 3. By the careful and speedy removal of all excremental matters from the patient's chamber. 4. By avoiding animal-food.

The putrid or putrescent matter already present in the body, may be evacuated partly by frequent evacuations of the contents of the intestines; and more effectually still by supporting the excretions of perspiration and urine by the plentiful use of diluents. That which remains in the body may be rendered more mild and innocent by the use of diluents, or may be corrected by the use of antiseptics. These last are of many and various kinds; but which of them are conveniently applicable, or more particularly suited to the case of fevers, is not well ascertained. Those most certainly applicable and useful are acescent aliments, acids of all kinds, and neutral salts.

The progress of putrefaction may be considerably retarded, and its effects obviated, by supporting the tone of the vessels; and this may be done by tonic medicines, of which the chief are cold, and the Peruvian bark, as already mentioned. The violence of re-action increasing the tendency to putrefaction, may be moderated by the means already mentioned under *synocha*.

These are the proper indications to be observed in the cure of the slow nervous fever. Dr Huxham Typhus. observes, that evacuations (especially bleeding) are improper even at the beginning. Even a common purgative given at this time hath been followed by surprising languors, syncope, and a train of other ill symptoms. However, it may sometimes be necessary to cleanse the stomach and primæ viæ by a gentle emetic, or a mild laxative. Indeed, where nausea, sickness, and load at stomach are urgent, as is frequently the case in the beginning of this fever, a vomit is necessary. Clysters of milk, sugar, and salt, may be injected with safety and advantage every second or third day, if nature wants to be prompted to stool. The temperate, cordial, diaphoretic medicines, are certainly, according to our author, most proper in these fevers; and a well-regulated, supporting, diluting diet is necessary. The latter of itself, judiciously managed, will go a great way in the cure, especially assisted by well-timed and well-applied blisters, and a due care to keep the patient as quiet as possible both in body and mind. But it should be noted, that any strong opiates are commonly very pernicious, however much the want of sleep and restlessness may seem to demand them. Mild diaphoretics, such as neutral draughts or elixir paregoricum, have much better effects; which, by raising a gentle easy sweat, or at least a plentiful perspiration, calm the hurry of the spirits, and a refreshing sleep ensues. Where the confusion and dejection of spirits are very considerable, blisters have been advised to be applied to the neck, occiput, or behind the ears; and during all this a free use of thin wine-whey, some pleasant ptisan or gruel, with a little soft wine, must be indulged. Indeed the patients, in this case, should drink frequently: though such quantities may not be necessary as in the ardent, or even putrid malignant fevers; yet they should be sufficient to carry on the work of dilution, support the sweats, and supply the blood with fresh and wholesome fluids, in place of that noxious matter which is continually passing off. In this view also a thin chicken-broth is of service, both as food and physic, especially towards the decline of the disease; and for the same reason thin jellies of hartshorn, sago, panada, are useful, adding a little wine to them, and the juice of Seville orange or lemon.

It is observable, that the sick are never so easy as when they are in a gentle sweat; for this soon removes the hurry of spirits, exacerbations of heat, &c. But profuse sweats should never be encouraged, much less attempted, by very strong heating medicines, especially in the beginning or advance of the fever; for they too much exhaust the vital powers, and are followed by a vast dejection of spirits, tremors, startings of the tendons, and sometimes end in rigors, cold clammy sweats, syncope, or a comatose disposition. Sometimes irregular partial heats and flushes succeed, with great anxiety, restlessness, delirium, difficulty of breathing, and a vast load and oppression in the præcordia, so as to incline the less cautious observer to think there may be something peripneumonic in it; but even here we must beware of bleeding, as the pulse will be found very small and unequal, tho' very quick. Nor is bleeding contra-indicated only by the weakness and fluttering

Febres fluttering of the pulse, but also by the pale, limpid, and watery urine which is commonly attendant. These symptoms denote the load, anxiety, and oppression on the præcordia to proceed from an affection of the nervous system, and not from a peripneumonic obstruction or inflammation. The breathing in this case, though thick and laborious, is not hot, but a kind of sighing or sobbing respiration, nor is there often any kind of cough concomitant; so that it has been conjectured to proceed from some spasm on the vitals. Here therefore the nervous cordial medicines are indicated, and blisters to the thighs, legs, or arms. Dr Huxham commonly used the following bolus and saline draught.

R. Pulv. contrayerv. comp. gr. xv.
Croc. Angl. gr. iij.
Confect. Ralegh. ℈j.
Syr. Croci q. s. M. *f. Bolus.*

R. Sal. C. C. ℈ss.
Succ. limon. ℥iij.
Aq. alexit. simpl. ℥iss. M. *Peracta effervescentia, adde Sp. lavend. c. Syr. croc.* ana ℥iss. *M. f. Haust.*

If great tremors and subsultus tendinum came on, he substituted half a scruple of musk instead of the contrayerva in the bolus, with advantage. One or other of these, or similar prescriptions, are to be taken every fifth, sixth, or eighth hour, and a temperate cordial julep may be now and then given out of thin wine or cyder whey, or, which is in many cases better, out of mustard-whey; which last is by no means a contemptible medicine. The saline draught made as above, is much more apt to pass through the pores of the skin than when made with salt of wormwood, which rather moves through the urinary passages.

The above-mentioned difficulty of breathing, anxiety, and oppression, many times precede a miliary eruption, which often appears on the seventh, ninth, or eleventh day of the fever, and sometimes later. Indeed great anxiety and oppression on the præcordia always precede pustular eruptions of any kind in all sorts of fevers. This eruption should be promoted by soft easy cordials and proper diluents; to which should be sometimes added some gentle aromatics. These tend to calm the universal uneasiness commonly complained of, and also very effectually promote a diaphoresis, or breathing kindly sweats, with which the miliary eruptions freely and easily advance. But however advantageous these commonly are, profuse sweats are seldom or never so, even though attended with a very large eruption. Two or three crops of these miliary pustules have been known to succeed one another, following profuse sweats, not only without advantage, but with great detriment to the patients, as they were thereby reduced to an extreme degree of weakness; so that they may justly be reckoned symptomatical rather than any thing else, and the consequent eruption is often merely the symptom of a symptom; for the miliary glands of the skin appear very turgid, and mimic a rash, after profuse sweating, even in the most healthy.

In these profuse colliquative sweatings a little generous red wine (diluted somewhat, if necessary may be given with the greatest advantage; as it presently moderates the sweats, supports the patient, and keeps up the miliary papulæ if they happen to attend. Towards the decline of the fever also, where the sweats are abundant and weakening, small doses of the tincture of the bark with saffron and snake-root were given with the greatest advantage, frequently interposing a dose of rhubarb to carry off the putrid colluvies in the first passages; which withal makes the remissions or intermissions that often happen in the decline of nervous diseases more distinct and manifest, and gives a fairer opportunity of throwing in the bark; for in the proper exhibition of this medicine we are to place our chief hope of curing both the nervous and putrid malignant fevers. Typhus.

II. Typhus gravior, or the *putrid, pestilential*, or *malignant* Fever. Sp. I. var. 2. 163

Febris pestilens, *P. Sal. Diverf.* de febre pestilenti.

Febris pestilens Ægyptiorum, *Alpin.* de med. Ægypt. l. i. cap. 14.

Typhus Ægyptiacus, *Sauv.* sp. 6.

Febris pestilens maligna, *Sennert.* de febribus, l. iv. cap. 10.

Febris maligna pestilens, *River,* l. xvii. sect. iii. cap. 1.

Febris pestilens maligna, ann. 1643. *Willis,* de febribus, cap. 14.

Typhus carcerum, *Sauv.* sp. 1.

Febris nautica pestilentialis, *Huxham* de aëre ad ann. 1740.

Miliaris nautica, *Sauv.* sp. g.

Febris putrida contagiosa in carceribus genita, *Huxham* de aëre ad ann. 1742.

Miliaris purpurata, *Sauv.* sp. h.

Febris carcerum et nosocomiorum. *Pringle,* Diseases of the army, p. 294. *Van Swieten,* Maladies des armés, p. 136.

Typhus castrensis, *Sauv.* sp. 5.

Febris castrensis, quam vulgo cephalalgiam epidemicam vocant, *Henr. Maii* et *A. Ph. Koph.* Diff. apud *Hallerum,* tom. v.

Febris Hungarica sive castrensis, *Juncker,* 74. et *plurium auctorum.*

Febris castrensis Gallorum in Bohemia, ann. 1742, *Scrinci.* Diff. apud *Haller.* tom. v.

Febris petechialis, *Sennert.* l. iv. cap. 13. *River.* prax. l. xvii. sect. iii. cap. 1. *Hoffm.* II. p. 84. *Juncker.* 73. *Huxham* on fevers, chap. 8. *Ludwig.* Inst. med. clic. n° 146. *Schreiber* von erkentness, und cur der Krank heiten. p. 126. *Monro,* Diseases of military hospitals, p. 1.

Febris catarrhalis maligna petechizans, *Juncker,* 72. *Hoffm* II. 75. *Eller* de cogn. et cur. morb. sect. vi.

Febris quæ lenticulas, puncticula, aut peticulas vocant, *Fracastorius* de morb. contag. lib. ii. cap. 6.

Febris peticularis Tridenti, ann. 1591. *Roboretus* de febr. peticul.

Febris petechialis epidemica Coloniæ ann. 1672. *Donckers,* Idia febris petechialis.

Febris petechialis epidemica Posonii, 1683, *C. F. Loew* in App. ad A. N. C. vol. ii.

Febris petechialis epidemica Mutinæ, 1692. *Ramazzini.* Const. Mutinensis, oper. p. 177.

Febris

Febres

Febris maligna petechizans, ann. 1698. *Hoffm.* II. p. 80.

Febris petechialis Wratiflaviæ ann. 1699. *Helwich*, Ephem. Germ. D. III. A. VII. et VIII. obf. 132 p. 616.

Febris epidemia Lipfiæ 1718. *M. Adolph.* A. N. C. III. obf. 131. p. 296.

Febris endemica et epidemica Corcagienfis ann. 1708, 1718, et feq. *Rogers*, Effay on epidemic difeafes.

Febris continua epidemica Corcagienfis ann. 1719. et feq. *M. O'Connel* Obf. de morbis.

Febris petechialis epidemica Cremonæ 1734. *Valcharengki* Med. ration. fect. 3.

Febris petechizans Petropoli 1735. *Weitbrecht.* Diff. apud Haller. tom. v.

Febris petechialis, ann. 1740, 1741, in Haffia, *Ritter.* A. N. C. vol. vii. obf. 4.

Febris maligna petechialis Rintelli 1741. *Furftenau.* A. N. C. vol. vii. obf. 5.

Febris petechialis epidemica Silefiæ 1741 et feq. *Bandhorft.* Diff. apud *Haller.* tom. v.

Febris petechialis epidemica Viennæ 1757. *Hafenohrl.* Hift. med. cap. 2.

Febris petechialis epidemica Lipfiæ 1757. *Luduvig.* Adverfar. tom. i. pars 1.

Febris petechialis epidemica variis Germaniæ locis ab. ann. 1755 ad 1761. *Strack* de morbo cum petechiis.

Defcription. This difeafe has been fuppofed to differ from the former in degree only; and there are many circumftances which would lead us to conclude, that both frequently originate from a contagion precifely of the fame nature. In the fame manner we fee, during different feafons, and in different circumftances, various degrees of malignity in fmall-pox. Though every inftance of the difeafe depends on the introduction of a peculiar and fpecific contagion into the body, yet this contagion in particular epidemics evidently poffeffes peculiar malignancy. The fame is probably the cafe with the typhoid fever: But whether this obfervation be well founded or not, there cannot be a doubt that the typhus gravior or putrid fever is a difeafe of the moft dangerous nature, as, befides the extreme debility of the nervous fyftem, there is a rapid tendency of the fluids to putrefaction, which fometimes cuts off the patient in a few days, nay, in the warm climates, in 12 or 14 hours; or if the patient recovers, he is for a long time, even in this country, in an exceedingly weak ftate, and requires many weeks to recover his former health.

The putrid fevers, according to Huxham, make their attack with much more violence than the flow nervous ones; the rigors are fometimes very great, though fometimes fcarce felt; the heats much fharper and permanent; yet, at firft, fudden, tranfient, and remittent: the pulfe more tenfe and hard, but commonly quick and fmall; though fometimes flow, and feemingly regular for a time, and then fluttering and unequal. The head-ach, naufea, and vomiting, are much more confiderable even from the beginning. Sometimes a fevere fixed pain is felt in one or both temples, or over one or both eye-brows; frequently in the bottom of the orbits of the eyes. The eyes always appear very dull, heavy, yellowifh, and very often a little inflamed. The countenance feems bloated, and more dead-coloured than ufual. Commonly the temporal arteries throb much, and a tinnitus aurium is very troublefome: a ftrong vibration alfo of the carotid arteries frequently takes place in the advance of the fever, though the pulfe at the wrift may be fmall, nay even flow: this is a certain fign of an impending delirium, and generally proceeds from fome confiderable obftructions in the brain.

Typhus.

The proftration of fpirits, weaknefs, and faintnefs, are often furprifingly great and fudden, though no inordinate evacuation happens; and this too fometimes when the pulfe feems tolerably ftrong. The refpiration is moft commonly laborious, and interrupted with a kind of fighing or fobbing, and the breath is hot and offenfive.

Few or none of thefe fevers are without a fort of lumbago, or pain in the back and loins; always an univerfal wearinefs or forenefs is felt, and often much pain in the limbs. Sometimes a great heat, load, and pain, affect the pit of the ftomach, with perpetual vomiting of porraceous or black choler, and a moft troublefome fingultus; the matter difcharged is frequently of a very naufeous fmell. The tongue, though only white at the beginning, grows daily more dark and dry; fometimes of a fhining livid colour, with a kind of dark bubble at top; fometimes exceeding black; and fo continues for many days together; nor is the tinct to be got off many times for feveral days, even after a favourable crifis: at the height of the difeafe, it generally becomes very dry, ftiff, and black, or of a dark pomegranate colour. Hence the fpeech is very inarticulate, and fcarce intelligible. The thirft in the increafe of the fever is commonly very great, fometimes unquenchable; and yet no kind of drink pleafes, but all feem bitter and mawkifh; at other times, however, no thirft is complained of, tho' the mouth and tongue are exceedingly foul and dry; this is always a dangerous fymptom, and ends in a frenzy or coma. The lips and teeth, efpecially near the height, are furred up with a very black tenacious fordes. At the onfet of the fever, the urine is often crude, pale, and vapid, but grows much higher-coloured in the advance, and frequently refembles a ftrong lixivium, or citrine urine, tinged with a fmall quantity of blood; it is without the leaft fediment or cloud, and fo continues for many days together: by degrees it grows darker, like dead ftrong high-coloured beer, and fmells very rank and offenfive. In petechial fevers, the urine hath often been feen almoft black and very *fetid.* The ftools, efpecially near the height, or in the decline of the fever, are for the moft part intolerably fetid, green, livid, or black, frequently with fevere gripes and blood. When they are more yellow or brown, the lefs the danger; but the higheft when they run off infenfibly, whatever their colour may be. It is likewife a very bad fymptom when the belly continues tenfe, fwollen, and hard, after profufe ftools; for this is generally the confequence of an inflammation or mortification of the inteftines. A gentle diarrhœa is often very beneficial, and fometimes feems to be the only way which nature takes to carry off the morbific matter.

Some-

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Sometimes black, livid, dun, or greenish spots appear, which always indicate a high degree of malignity; however, the more florid the spots are, the less danger is to be feared. It is also a good sign when the black or violet petechiæ become of a brighter colour. The large, black, or livid spots, are almost always attended with profuse hæmorrhagies; and the small, dusky, brown spots, like freckles, are not much less dangerous than the livid or black; though they are seldom accompanied with fluxes of blood: excessively profuse, cold, clammy sweats are often concomitant, by which also they sometimes vanish, though without any advantage to the patient. The eruption of the petechiæ is uncertain; sometimes they appear on the fourth or fifth day, though sometimes not till the eleventh, or even later. The *vibices*, or large dark, blue, or greenish marks, seldom appear till very near the fatal period. Frequently also we meet with an efflorescence like the measles in malignant fevers, but of a much more dull and livid hue; in which the skin, especially on the breast, appears as it were marbled or variegated. This in general is an ill symptom, and is often attended with fatal consequences.

Sometimes about the 11th or 14th day, on the occurrence of profuse sweats, the petechiæ disappear, and vast quantities of white miliary pustules break out. This is seldom found of any considerableadvantage; but an itching, smarting, red rash, commonly gives great relief; and so do the large, fretting, watery bladders, which many times rise upon the back, breast, shoulders, &c. A scabby eruption likewise about the lips and nose is certainly one of the salutary symptoms; and the more hot and angry it is, so much the better. But of much more uncertain and dangerous event are the brown-coloured aphthæ; nor are those that are exceeding white and thick, like lard, of a very promising aspect. They are soon succeeded by great difficulty of swallowing, pain and ulceration of the fauces, œsophagus, &c. and with an incessant singultus: the whole *primæ viæ* become at last affected; a bloody dysentery comes on, followed by a sphacelation of the intestines; as is evident from the black, fanious, and bloody stools, extremely fetid and infectious. Vibices, or large, black, and bluish marks resembling bruises, are frequently seen towards the close of the fever; and, when attended with lividity and coldness of the extremities, are certain tokens of approaching death. In some cases, the blackness hath been known to reach almost to the elbows, and the hands have been dead-cold for a day or two before the death of the patient.

Such are the general appearances of the putrid malignant fever in this country, among those who enjoy a free air, and are not crowded together, or exposed to the causes of infection: but in jails, hospitals, or other places where the sick are crowded, and in some measure deprived of the benefit of the free air, the symptoms are, if possible, more terrible. Sir John Pringle, who had many opportunities of observing it, tells us, that the jail or hospital fever, in the beginning, is not easy to be distinguished from a common fever. The first symptoms are slight interchanges of heat and cold, a trembling of the hands, sometimes a sense of numbness in the arms, weakness of the limbs, loss of appetite; and the disorder increasing towards night, the body grows hot, the sleep is interrupted, and not refreshing. With these symptoms, for the most part, there is some pain or confusion in the head; the pulse at first is a little quicker than natural, and the patients find themselves too much indisposed to go about business, though too well to be wholly confined. When the fever advances, the above-mentioned symptoms are in a higher degree; and in particular the patient complains of a lassitude, nausea, pains in his back, a more constant pain and confusion in his head, attended with an uncommon dejection of spirits. At this time the pulse is never sunk, but beats quick, and often varies in the same day both as to strength and fulness. It is little affected by bleeding once, if a moderate quantity of blood be taken away; but if the evacuation be large, and especially if it be repeated, to answer a false indication of inflammation, the pulse, increasing in frequency, is apt to sink in force, and often irrecoverably, whilst the patient becomes delirious. But withal we must observe, that, in every case, independent of evacuations, the pulse sooner or later sinks, and then gives certain intelligence of the nature of the disease. The appearance of the blood is various; for though it be commonly little altered, yet sometimes it will be sizy, not only on the first attack, but after the fever is formed. The worst appearance is when the crassamentum is dissolved; though this does not happen till the advanced state of the fever: though indeed this seems not easy to be ascertained, as blood has been so seldom taken away at that time. The urine is also various. Sometimes it is of a reddish or flame colour, which it preserves a long time; but it is oftener pale, and changes from time to time in colour as well as crudity, being sometimes clear, sometimes clouded: towards the end, upon a favourable crisis, it becomes thick, but does not always deposit a sediment. If the sick lie warm, and have had no preceding flux, the belly is generally bound; but when they lie cold, as they often do in field-hospitals, the pores of the skin being shut, a diarrhœa is a common symptom, but is not critical. In the worst cases, a flux appears in the last stage; then the stools are involuntary, colliquative, ichorous, or bloody, and have a cadaverous smell; the effects of a mortification of the bowels, and the signs of approaching death. When the hospitals are filled with dysenteric patients, some of the nurses will be infected with the flux only, and others with this fever, ending in these bloody and gangrenous stools.

In the beginning the heat is moderate; and even in the advanced state, on first touching the skin, it seems inconsiderable; but upon feeling the pulse for some time, we are sensible of an uncommon ardour (the *calor mordicans*, as it has been called), leaving an unpleasant sensation on the fingers for a few minutes after. A day or two before death, if care be not taken, the extremities become cold, and the pulse is then hardly to be felt. The skin is generally dry and parched; though sometimes there are longer or shorter sweats, especially in the beginning. Such as are produced by medicine are of no use, except on the first attack, at which time they will often remove the fever; and natural sweats are never critical till the distemper begins to decline. These last are rarely profuse,

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profuse, but gentle, continued, and equally diffused over the body: sometimes the disease will terminate by an almost imperceptible moisture of the skin; the sweats are usually fetid, and offensive even to the patient himself.

The tongue is commonly dry; and, without constant care of the nurse, becomes hard and brown, with deep chops: but this symptom is common to most fevers. At other times, though rarely, the tongue is soft and moist to the last, but with a mixture of a greenish or yellowish colour. The thirst is sometimes great, but more frequently moderate. In the advanced state, the breath is offensive, and a blackish furring gathers about the roots of the teeth.

Some are never delirious, but all lie under a stupor or confusion; few retain their senses till death: many lose them early, and from two causes; either from immoderate bleeding, or the premature use of warm and spirituous medicines. They rarely sleep; and, unless delirious, have more of a dejected and thoughtful look than what is commonly seen in other fevers. The face is late in acquiring either a ghastly or a very morbid appearance; yet the eyes are always muddy, and generally the white is of a reddish cast as if inflamed. The confusion of the head generally rises to a delirium, especially at night; but, unless by an unseasonable hot regimen, it seldom turns to rage, or to those high flights of imagination common in other fevers. When the delirium comes to that height, the face is flushed, the eyes red, the voice is quick, and the patient struggles to get up But when that symptom is owing to large evacuations, or only to the advanced state of the disease, the face appears meagre; the eye-lids in slumbers are only half shut; and the voice, which is commonly low and slow, sinks to a degree scarce to be heard. From the beginning there is generally a great dejection and failure of strength. A tremor of the hands is more common than a starting of the tendons; or if the subsultus occurs, it is in a lesser degree than in many other fevers. In every stage of the disease, as the pulse sinks, the delirium and tremor increase; and in proportion as the pulse rises, the head and spirits are relieved. Sometimes in the beginning, but for the most part in the advanced state, the patient grows dull of hearing, and at last almost deaf. When the fever is protracted, with a slow and low voice, the sick have a particular craving for something cordial, and nothing is so cordial or so acceptable as wine. They long for no food, yet willingly take a little panada if wine be added. But such as are delirious, with a quick voice, wild looks, a subsultus tendinum, or violent actions, though their pulse be sunk, yet bear neither hot medicines, wine, nor the common cordials.

Vomiting, and complaints of a load and sickness at stomach, though usual symptoms, are not essential to the disease; nor are pleuritic stitches, difficulty in breathing, or flying pains, to be referred so much to it as to the constitution of the patient, or to a preceding cold.

A petechial efflorescence is a frequent, though not an inseparable, attendant of this fever. It sometimes appears of a brighter or paler red, at other times of a livid colour, but never rises above the skin. The spots are small; but generally so confluent, that at a little distance the skin appears only somewhat redder than ordinary, as if the colour was uniform; but upon a nearer inspection there are interstices seen. For the most part this eruption is so little conspicuous, that unless it be looked for attentively, it may escape notice. The spots appear thickest on the back and breast, less on the legs and arms, and Sir John Pringle never remembers to have seen any on the face. As to the time of their appearance, he agrees entirely with Dr Huxham. These spots are never critical, nor are they reckoned among the mortal symptoms; but only concur with other signs to ascertain the nature of the disease. The nearer they approach to purple, the more they are to be dreaded. In a few cases, instead of spots, purple streaks and blotches were observed. Sometimes the petechiæ did not appear till after death; and there was one case in which, after bleeding, the petechiæ were seen only on the arm below the ligature, and nowhere else on the skin.

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The hospital fever, though accounted one of the continued kind, yet has generally some exacerbation at night, with a remission and often partial sweats in the day; and after a long continuance it is apt to change into a hectic, or an intermitting form. The length of the disease is uncertain. Sometimes it terminated either in death or recovery, in seven days after the patient took to his bed; but in the hospitals it generally continued from 14 to 20, and some died or recovered after four weeks. From the time of the sinking of the pulse until death or a favourable crisis, there is perhaps less change to be seen from day to day in this than in most other fevers. When its course is long, it sometimes terminates in suppurations of the parotid or axillary glands; and when these do not appear, it is probable that the fever is kept up by the formation of some internal abscess. The parotid glands themselves do not suppurate, but only some of the lymphatic glands that lie over them. Sir John Pringle observed one instance of a swelling of this kind on both sides, without any previous indisposition, when the person, not suspecting the cause, and applying discutient cataplasms, was, upon the tumor subsiding, seized with the hospital-fever. Many patients after the crisis of this fever complain of a pain in the limbs and want of rest; and almost all of them mention great weakness, confusion in their head, vertigo, and a noise in their ears.

Ten of the bodies of those who died of this distemper in Houghton's regiment were opened. In some, all the cavities were examined; in others, only the brain or the bowels. In some of them, the brain appeared to be suppurated. The first of this kind Sir John Pringle met with at Ghent; but the man being brought into the hospital from the barracks no earlier than two days before he died, he could only conjecture from the symptoms and the imperfect accounts he had of him, that his death was owing to a fever of this kind, after lingering near a month in it. About three ounces of purulent matter were found in the ventricles of the brain, and the whole cortical and medullary substance was uncommonly flaccid and tender; nay, some of the same kind of matter was found in the substance of the upper part of the cerebellum: yet this person, with some stupor and deafness, had his senses till the night before he died; so far, at least, that he answered distinctly when roused and spoken to; but about that time

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These suppurations, however, were not constant; for another who died about the same time, and had been ill about the same number of days with the like symptoms, the pale water excepted, had no abscess either in the brain or cerebellum. And two were opened afterwards, in whom the cortical substance of the brain had an inflammatory appearance, but no suppuration In one of them the large intestines were corrupted: that man went off with a looseness; and just before he died, an ichorous matter was discharged from his nose. In the military hospital at Ipswich, one who unexpectedly died of this fever after having been seemingly in a fair way of recovery, had no suppuration in his brain; but in another, who died after an abscess in both orbits, the brain was found flaccid, and about two ounces of a thin serum in the ventricles.

Causes of, and persons subject to, this disorder. The cause of this fever, as well as that of the slow nervous fever, is an infection or contagion from some diseased animal-body, or from corrupted vegetables; and therefore is very little, if at all, different from those pestilential disorders which have arisen after battles, when great numbers of dead bodies were allowed to lie above ground, and infect the air with their effluvia. This is confirmed by an observation of Forestus, who was eye-witness to a distemper of this kind (which indeed he calls a *plague*) owing to the same cause, attended with buboes and a high degree of contagion. The same author also gives an account of a malignant fever breaking out at Egmont in North-Holland, occasioned by the rotting of a whale which had been left on the shore. We have a like observation of a fever affecting the crew of a French ship, by the putrefaction of some cattle which they had killed on the island of Nevis in the West Indies. These men were seized with a pain in their head and loins, great weakness, and a disorder of the stomach, accompanied with fever. Some had carbuncles; and on others purple spots appeared after death.

Galen assigns two causes for pestilential fevers: 1. The great heat of the weather, when the humours happen to be in a more putrescent state than usual. 2. A putrid state of the air, arising either from a multitude of dead bodies left unburied, as after a battle, or from the evaporation of corrupted lakes and marshes.

Typhus — One of the most remarkable diseases incident to an army is related by Diodorus, as breaking out among the Carthaginians at the siege of Syracuse. That author not only relates some of its most distinguishing symptoms, but reasons well about its cause. He observes, that pains in the back and eruptions (φλυκταιναι) were common; that some had bloody stools; that others were seized with a delirium, so as to run about and beat all that came in their way; that the physicians knew no cure; and that it was the more fatal as the sick were abandoned by every body on account of the contagion. As to the cause, the author takes notice of the multitude of people confined within a narrow compass; of the situation of the camp in a low and wet ground; of the scorching heats in the middle of the day, succeeded by the cold and damp air from the marshes in the night-time; to these he adds, the putrid steams arising first from the marshes, and afterwards from the bodies of those who lay unburied.—This distemper seems to have been a compound of the marsh and pestilential fever.

Forestus remarks, that, from the putrefaction of the water only, the city of Delft, where he practised, was scarce ten years together free from the plague or some pestilential distemper. He adds, that the magistrates, upon his representation of the cause, erected a wind-mill for moving and refreshing the water. At that time Holland was much more subject to inundations and the stagnation of water than at present. In 1694, a fever broke out at Rochfort in France, which, on account of the uncommon symptoms and great mortality, was at first believed to be the plague. But M. Chirac, who was sent by the court to inquire into its nature, found the cause to arise from some marshes that had been made by an inundation of the sea; and observed, that the corrupted steams, which smelled like gun-powder, were carried to the town by the wind, which had long blown from that quarter. About two-thirds of those who were taken ill died. In such as were opened, the brain was found either inflamed or loaded with blood; the fibres of the body were uncommonly tender; and the bowels had either suppurated or were mortified.

It is needless to mention more instances of pestilential fevers being brought on by the steams of corrupted substances, whether animal or vegetable. In general it may be remarked, that the putrefaction of these substances in a dry air is more apt to bring on a fever of the continued form; but in a moist air hath a greater tendency to produce remitting fevers. But it must also be observed, that, even in cases where the most malignant fevers prevail, all persons are not equally disposed to receive the infection, though equally exposed to it with others. Some, through mere vigour of body and mind, cannot be infected with the most contagious diseases; while, on the other hand, those whose bodies are debilitated by a former disease, by study, low diet, or want, or those who have laboured under any of the depressing passions of the mind for some time, seldom or never escape. Men, therefore, who have been weakened by accidents (as those who have undergone a mercurial salivation) are very apt to fall into this distemper. Those who are taken into crowded hospitals, ill of the small-pox,

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however good the fort may be, fall readily into this fever, and run a greater rifk of dying of it than others. The fecond fever is attended with double danger, feeing the patient has been fo much weakened by the firft. A fure fign of the corruption of the air in an hofpital is when many of the nurfes fall fick.

Prognofis. In thefe fevers we cannot draw a prognoftic from any fymptom by itfelf: and perhaps all of them together are more fallible than in others. Generally the following are good: To have little delirium; the ftrength little impaired; turbid urine in the decline of the difeafe; and at that time a gentle fweat or moifture diffufed over the body, or even the fkin foft and the tongue moift; or to have fome loofe ftools fucceeded by a diaphorefis; the pulfe to rife by wine or cordials, with an abatement of the ftupor, tremor, and other affections of the brain. Deafnefs is rather a good fign. A fediment in the urine, without other changes to the better, is no fure fign of recovery; and fome have recovered in whofe water there was no fediment.—The bad figns are, a fubfultus tendinum; the eyes much inflamed and ftaring; the fpeech quick, and the found of the voice altered; a high delirium; perpetual watchfulnefs; conftant ficknefs at the ftomach, and vomitings; frequent ftools, with a finking pulfe, and the diforder of the head increafed; coldnefs of the extremities, and a tremulous motion of the tongue. It is obferved to be among the worft figns when the patient complains of blindnefs; when he fwallows with difficulty, or cannot put out his tongue when defired to do it; when he can lie on his back only, and pulls up his knees; or when infenfible he endeavours to uncover his breaft, or makes frequent attempts to get out of bed without affigning any reafon. If to any of thefe are added ichorous, cadaverous, and involuntary ftools, it is a fign of a mortification of the bowels and approaching death. It will not feem ftrange to find moft of thefe prognoftics common to the advanced ftate of other fevers, when we confider, that from whatever caufe fevers begin, by a long continuance the humours are corrupted, and the brain and nerves affected much in the fame manner as in thofe which arife from infection.

Prevention and cure. As diftempers of the putrid kind never arife without an infection received from fome quarter or other, the methods of prevention muft evidently be reduced to two general heads. 1. To avoid receiving the infection into the body; and, 2. To put the body in fuch a fituation as may enable it to refift the infection when received. On both thefe methods fcarce any writer hath equalled Dr Lind of Haflar, whofe opinions and directions therefore we fhall give pretty fully.

As putrid difeafes are very common and violent in the hot countries, it is very neceffary for Europeans who vifit thefe climates to be well informed, in the firft place, of the figns of an unhealthy country, that they may be upon their guard as foon as they enter any foreign region. Thefe figns are by our author enumerated as follows.

1. A fudden and great alteration in the air, at funfet, from intolerable heat to a chilling cold. This is perceived as foon as the fun is down, and is for the moft part accompanied with a very heavy dew: it fhows an unhealthy fwampy foil, the nature of which is fuch, that no fooner the fun-beams are withdrawn, than the vapours emitted from it render the air damp, raw, and chilling, in the moft fultry climates; fo that even under the equator, in fome unhealthy places, the night-air is very cold to an European conftitution.

2. Thick noifome fogs, chiefly after funfet, arifing from the valleys, and particularly from the mud, flime, or other impurities. In hot countries, the fmell of thefe fogs may be compared to that of a new-cleaned ditch. Difeafes therefore, arifing from this caufe, generally take place in the night, or before fun rifing.

3. Numerous fwarms of flies, gnats, and other infects which attend ftagnated air and unhealthy places covered with wood.

4. When all butchers meat foon corrupts, and in a few hours becomes full of maggots; when metals are quickly corroded on being expofed to the air; and when a corpfe becomes intolerably offenfive in lefs than fix hours; thefe are proofs of a clofe, hot, and unwholefome country. And in fuch places, during exceffive heats and great calms, it is not altogether uncommon for Europeans, efpecially fuch as are of a grofs habit of body, to be feized at once with the moft alarming and fatal fymptoms of what is called the *yellow fever*, without even any previous complaint of ficknefs or other fymptoms of the difeafe. There has firft been perceived an uneafy itching fenfation, commonly in the legs; and upon pulling down the ftockings, ftreams of thin diffolved blood followed, a ghaftly yellow colour quickly diffufed itfelf over the whole body, and the patient has been carried off in lefs than forty-eight hours.

5. A fort of fandy foil, commonly a fmall, loofe, white fand, as that at Penfacola, Whydah, and the ifland of Bonavifta, which is found by experience to be injurious to health. The peftiferous vapour arifing, during the fummer months and in the heat of the day, from fuch a fandy foil, is beft characterifed by its effects in the extenfive defarts of Afia and Africa. It there conftitutes what is called the *Samiel-wind*; a blaft which, in the parched defart, proves inftantly fatal both to man and beaft: but when it paffes over a foil well covered with grafs and vegetables, has its effects greatly mitigated; it is, however, even then, productive of ficknefs: thus the foutherly winds, while they blow from the defarts of Libya during the fummer, at Algiers, Tunis, and Tripoli, produce an unhealthy feafon; and at Madras the winds, which, in the months of April and May, pafs over a large tract of fand, are always hot, difagreeable, and unwholefome.

During thefe land-winds, fudden gufts of a more hot and fuffocating nature are often obferved to come from thefe fands once or twice, or even more frequently, in a day, which feem to be this vapour in a purer form. Thefe gufts pafs very quickly, and affect perfons who happen to ftand with their faces towards them in the fame manner as the hot air which iffues from a burning furnace, or from a heated oven, and obliges them immediately to turn away from it in order to recover breath. The effect of this hot fuffocating blaft or vapour on the human body, even when mitigated by paffing through a moift atmofphere, is the fame as that of intenfe cold; it fhuts up every pore of the fkin, and entirely ftops the perfpiration of fuch

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Febres. as are exposed to it. These blasts come only in the day-time, and always from the desarts. Water is the only known corrector or antidote against them: hence, coarse thick clothes, kept constantly wet, and hung up at the windows or doors, greatly mitigate their violence. A house so built as to have no windows or doors towards the desarts, is an excellent protection against their pernicious effects. The hot land-winds constantly blow at Madras and other places on the coast of Coromandel, at that season, from midnight till noon: the sea-breezes then begin, which relieve the difficulty in breathing, and the obstructed perspiration which the former occasioned.

That the heat of these land-winds, as also of the sudden gusts which accompany them, proceed from large tracts of sand heated by the sun, is evident from the increased heat and suffocating quality of those winds, in proportion as the day advances, and as the heat of the season is increased. The opposite winds, blowing from each side of the Balagate-mountains, are a farther proof of this. These mountains, running from north to south, divide the hither Peninsula of India into two unequal parts, and separate what is called the *Malabar* from the *Coromandel* coast. To the former they are very near, but at a great distance from the latter. The winds blowing from those hills are on the Malabar-coast always remarkably cool; but on the coast of Coromandel, in the months of April, May, June, and July, are extremely hot and suffocating, as they pass over a large tract of intermediate sand, heated during those months by an almost vertical sun. Hence the Malabar coast is always covered with an agreeable verdure; whereas the Coromandel coast, during the continuance of these hot winds, seems a barren wilderness, nothing appearing green except the trees. On the contrary, the winds that pass over these sands, after being wet with the rains, are the coldest which blow at Madras. Bottles of liquor inclosed in bags of coarse cloth, kept constantly wet, and suspended in the shade, where those hot winds may have access to them, become as cold as if they had been immersed in a solution of nitre; an effect owing undoubtedly to the constant evaporation of water from the surface.

It is an observation of the natives on the coast of Coromandel, which is confirmed by the experience of many Europeans, that the longer the hot land-winds blow, the healthier are the ensuing months; these winds, as they express it, purifying the air. Are not the winds therefore the cause why the air on the coast of Coromandel, except during their continuance, is more healthy than in other parts of India where these winds do not blow? Does not this also suggest a very probable reason, why the plague in Egypt generally ceases in the beginning of June; the periodical hot winds which come from the desarts of Nubia and Ethiopia having then rendered the air of Egypt pure and wholesome? Many have ascribed that effect to the north-winds; as the plague not only ceases when they blow, but all infected goods, household-furniture, and wearing apparel, are then said to become entirely free from the contagion: these, however, cannot be the cause, as the most destructive plague is abated in its violence, if not wholly eradicated, before they set in. With equal propriety we may reject the opinion that the overflowing of the Nile is productive Typhus. of that salutary effect, as the plague generally ceases before the increase of that river is perceptible.

Thus the plague, the greatest calamity which can afflict mankind, seems to be destroyed by those hot winds, which are otherwise so pernicious to animal and vegetable life. And although, during the continuance of these winds, the most fruitful fields wear the aspect of a parched desart, yet no sooner the rains fall, but vegetation is restored, the plants revive, and a beautiful verdure is again spread over the face of the country.

Having thus given an account of the signs of an unhealthy country, Dr Lind next proceeds to mention such employments as are particularly dangerous to Europeans on their first arrival. One of these is the cutting down of trees, shrubs, &c. or *clearing the ground*, as it is called. Of the unhealthiness of this employment he gives two instances. At the conclusion of the late peace, the captain of a ship of war went on shore at the island of Dominica, with 12 of his men, to cut down the wood, and to clear a piece of ground which he intended to have purchased: but, in a few days, sickness obliged him to desist from this dangerous work; the captain and 11 of his men being seized with violent fevers, which terminated in obstinate intermittents, and of which several died. The survivors suffered so much in their constitutions, that, even after they came to England, the return of an east-wind was apt to bring on a violent fit of the ague. The Ludlow-Castle, a ship of war of 40 guns, in a voyage to the coast of Guinea, also lost 25 of her men at Sierra Leona, who were employed in cutting down wood for the ship. This is an occupation which has often proved destructive to Europeans in those climates, and in which they ought never to be employed, especially during the rainy season; there being numberless instances of white persons, when cutting down the woods at that season, who have been taken ill in the morning, and dead before night.

Another evil, less known, and less suspected, but no less dangerous, is the sending of Europeans in open boats after sunset, where the soil is swampy, or where there are great night fogs. The single duty alone of fetching fresh-killed butchers meat at night for the use of our ships companies in the East and West Indies, has destroyed every year several thousand seamen. In those parts of the world, butchers meat must be brought on board at night immediately after it is killed, otherwise it will not be fit for use the next day; but a contract made with the natives to send it on board at that time, which might be done for a trifling sum, would be the means of preserving many useful lives. During the sickly season at Batavia, a boat belonging to the Medway, which attended on shore every night, was three times successively manned, not one having survived that service. They were all taken ill in the night, when on shore, or when returning on board; so that at length the officers were obliged to employ none but the natives on that business. Great numbers of men have perished from being employed in this manner at Bengal, where the European ships often anchor in the most unhealthy spots of the river; and even when the great night-fogs arise, after the rainy season, the men are often obliged to perform such night services in

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boats. Now since it is so dangerous for Europeans in unhealthy countries, particularly during a season of sickness, to be exposed in an open boat to the foggy night-air, it must appear, that sending them unsheltered, in open boats, far up rivers, in unhealthy southern climates, for the sake of wood, water, trade, or other purposes, must be attended with the most destructive and fatal consequences.

Burying the dead in swampy countries is another occupation which has proved fatal to many, and which ought to be entrusted to negroes or the natives of the country. The effluvia from the ground when newly opened, whether from graves or ditches, are far more dangerous than from the same swampy soil when the surface is undisturbed; nay, in some places, it has been found almost certain death for an European to dig a grave, unless long seasoned to the country. In such a place, the attendance of friends at funerals ought to be dispensed with.

In all cases where it is practicable, the ships which visit these unhealthy countries should anchor at as great a distance as possible from shore; or if obliged to anchor near marshy grounds or swamps, especially during summer or in hot weather, and when the wind blows directly from thence, the gun-ports which would admit the noxious land-breeze ought to be kept shut, especially at night. Or if the ship rides with her head to the wind, a thick sail ought to be put upon the fore-mast, along which the smoke from the fire-place might be made constantly to play and ascend. If the sail should occasion a little smoke between decks, this inconvenience will be sufficiently compensated by its keeping off the direct stream of the swampy shore effluvia; which now being obliged to form a curve before they reach the more distant parts of the vessel, must needs be greatly diverted and scattered.

The best preservative against the mischievous impressions of a putrid fog, or of a marshy exhalation, is a close, sheltered, and covered place; such as the lower apartments in a ship, or a house in which there are no doors or windows facing the swamps. If in such places a fire be kept either at the doors and other inlets to a house, or in the chambers, as is practised in some unhealthy countries during the rainy or foggy season, it will prove an excellent and effectual protection against the injuries of a bad air. On board of ships also fires may be made at the hatchways; and of the good effects of this we have the following example. When the Edgar, a ship of war of 60 guns, was upon the coast of Guinea in the year 1768, her men were very sickly, and many of them died: however it was observed, that in a sloop of war, which was constantly in company with her, few were taken ill, and not one died during the whole voyage. This could be ascribed to no other cause, but that in the sloop the fire-place for cooking victuals was on the same level with the deck where the men lay; and every morning when the fire was lighted, especially when there was but little wind, the smoke from the cook-room spread itself all over the ship, and particularly over those parts where the men lay; but from the construction of the fire-place of the Edgar, no smoke from it ever came between her decks.

Persons on board any ship whatever, are much more safe, and their situation is much preferable to that of those who make distant inland excursions in small boats upon the rivers, and who are for the most part ignorant of the cause of those maladies which destroy them. The intolerable heat at noon often obliges such persons to go in a manner half-naked; while a free and plentiful perspiration issues from every pore. A near approach to putrid swamps at this time is apt to produce an immediate sickness, vomiting, and afterwards a low nervous or malignant fever. But if they happen to pass them at night, or lie near them in an open boat, the air from those swamps is perceived to be quite chill and cold; in so much that warm thick clothing becomes absolutely requisite to guard the body against the impressions of so great an alteration in the air, and against its cold and inclement quality: for the effects of it then, even on the most healthy and vigorous constitution, is frequently a chilling cold fit of an ague, terminating in a fever with delirium, bilious vomitings, a flux, or even death itself.

But where such exposure becomes unavoidable, the only method is then to defend the body as much as possible against the pernicious miasmata with which the air abounds.—All those who are employed in cutting down woods, or in other laborious and dangerous services in hot climates, during the heat of the day ought to have their heads covered with a bladder dipt in vinegar, and to wash their mouths often with the same liquor; never to swallow their spittle, but rather to chew a little rhubarb or some other bitter, and spit it out frequently; to stop their nostrils with a small bit of linen or tow dipped in camphorated vinegar; and to infuse some bark, garlic, and rhubarb, in brandy, of which a dram is to be taken, either by itself or diluted with water morning and evening.

In the evening before sunset they should leave off work, and not return to their labour in the morning till the sun has dispersed the unwholesome dews and vapours. Those who must of necessity remain on shore, and sleep in dangerous places, must take care not to sleep upon the ground exposed to the dews, but in hammocks in a close tent, standing upon a dry sand, gravel, or chalk, near the sea shore, and where there is no subterraneous water for at least four feet below the surface of the ground. The door of this tent should be made to open towards the sea; and the back part of it, which receives the land breeze, must be well secured by double canvas, or covered with branches of trees. But in such circumstances, a hut, when it can be procured, is preferable to a tent, especially if it be well thatched, so as to prove a defence both against the excessive heat of the sun by day, and the noxious dews which fall at night. Here the men may be enjoined to smoke tobacco. When the air is thick, moist, and chill, the earth being overspread with cold dew, a constant fire must be kept in and about the tent or hut, as the most excellent means of purifying such unwholesome air, and of preserving the health of those who either sleeping or waking are exposed to its influence. The centinels who guard the water-casks, ought likewise at such a time to have a fire burning near them. All old and forsaken habitations, natural caves and grottos in the earth, where the men may be induced to take up their abode, must before their admission be perfectly dried and purified

with

Fevers. with fufficient fires. Fire and fmoke are undoubtedly the great purifiers of all tainted and unwholefome air, and the moft excellent prefervatives againft its noxious influence. It is the cuftom of the negroes in Guinea, and alfo of fome Indians (who both fleep for the moft part on the ground), to have a fire, producing a little fmoke, conftantly burning in their huts where they fleep. This not only corrects the moifture of the night, but alfo, by occafioning more fmoke than heat, renders the damp from the earth lefs noxious; of which Dr Lind gives the following remarkable inftance. A Guinea fhip being up one of the rivers for the fake of trade, it was found to be very dangerous to fleep on fhore; without which their trade could not be fo conveniently carried on. Firft the captain, then the mate, and two or three of the feamen, were taken ill; each of them the morning after they had lain on fhore. By thefe accidents the men were greatly intimidated from lying afhore; till the furgeon boldly offered to try the experiment on himfelf. Next morning when he waked, he found himfelf feized, as the reft, with a giddinefs and pain in the head, &c. He immediately acquainted one of the negroes with his condition, who carried him to his hut, and fet him down in the fmoke of it; when his fhiverings and giddinefs foon left him. He then took a dram of the bark bitter; and found himfelf greatly relieved, efpecially by breathing fome time in the fmoke.—Thus inftructed by the negro, he ordered a large fire to dry the hut he flept in; and afterwards had every night a fmall fire fufficient to raife a gentle fmoke, without occafioning a troublefome heat: and by this means he and feveral others, ufing the fame precautions, flept many nights on fhore without any inconvenience.

Fire and fmoke indeed are found to be certain correctors, or rather deftroyers, of infection in all cafes, whether arifing from the noxious effluvia of marfhes, or from the contagion of difeafed bodies. Even thofe moft extraordinary and fatal damps called *harmattans*, are unable to refift the falutary effects of fmoke. In other cafes, Dr Lind remarks, that, under fome circumftances, the fource of an infection in a fick chamber or any other place, may be removed or deftroyed by accidental means, for which we cannot account, and which we often cannot afcertain. But it oftener happens, that it is very difficultly rooted out; and that exact cleanlinefs, with the benefit of a pure air, often proves infufficient to remove the evil. Smoke, however, has never been known to fail. It is not to be doubted, that, excepting the true plague, there has been an infection fully as peftilential and as mortal in fome fhips as in any other place whatever; yet it has never been heard, that any fhip, after having been carefully fmoked, did not immediately become healthy: and if afterwards they turned fickly, it was eafy to trace that ficknefs from other infected fhips, jails, and the like places.

There are three methods practifed for purifying veffels after the men have been removed out of them. The firft is by burning of tobacco. A quantity of tobacco is fpread on feveral fires, made with fuch old pieces of rope as are called *junk*. Thefe are difperfed into different places of the fhip, and their heat and fmoke afterwards clofely confined below for a confiderable time.—The fecond method is by charcoal fires ftrewed with brimftone. The heat and fteam of thefe burning materials muft alfo be long and clofe fhut up: but, although this fume, properly applied, has been found by experience to purify moft effectually tainted apartments, fhips, clothes, &c. yet there are fome kinds of vermin which it will not deftroy, particularly lice. The third method of purification is performed by the addition of arfenic to the materials of the fecond procefs, in the following manner. After carefully ftopping up all the openings and every fmall crevice of the fhip (as was alfo neceffary in the preceding proceffes), a number of iron pots, properly fecured, are to be placed in the *hold*, *orlope*, *gun-deck*, &c. Each of thefe are to contain a layer of charcoal at the bottom, then a layer of brimftone, and fo alternately three or four layers of each, upon which the arfenic is to be fprinkled, and on the top of it fome oakum dipped in tar is to be laid to ferve as a match. The men, upon fetting fire to the oakum, muft fpeedily leave the place, fhutting clofe the hatchway by which they came up.

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From the known and experienced efficacy of thefe proceffes, it appears, that fire and fmoke are the moft powerful agents for annihilating infection; and, it may be prefumed, even the plague itfelf. This is in fome meafure agreeable to what we learn from the ancient records of phyfic. But the prepofterous ufe, or rather abufe, of fire on fuch occafions, has caufed its effects to be difregarded by fome, and to be fufpected of mifchief by others. The modern practice of burning large fires in the open air, in the ftreets, and about the walls of towns infected with the plague or other contagion, is founded on principles groundlefs and erroneous; and has therefore been found by experience not only unfuccefsful, but hurtful. But though this muft be allowed, it doth not thence by any means follow, that when once a houfe hath been infected, and the patients removed from it, the doors and windows at the fame time being fhut, that fuch fires will then prove hurtful; or that, by this method of purification, all the feeds of contagion will not be effectually deftroyed. Whenever, therefore, perfons die of a fpotted fever, a malignant fore throat, the fmall-pox, or any diftemper found to be communicable from the fick to others, the corpfe ought quickly after death to be removed into another room; that in which the perfon died fhould be well aired, by having the windows opened, till a charcoal-fire be kindled, with fome rolls of fulphur upon it; after which, both doors and windows fhould be kept fhut for a confiderable time, not lefs than eight or ten hours, till the room be thoroughly fmoked. In feveral fhips, where there are the faireft opportunities of trying and judging things of this nature, the contagion of the fmall-pox has been entirely ftopped by wood-fires, fprinkled with brimftone, kept burning and clofely confined in the infected place. In a word, a judicious and proper application of fire and fmoke is the beft means for the deftruction and utter extinction of the moft malignant fources of difeafe; and they are befides the greateft purifiers of all bad and tainted air.

Next to the fmoke of wood for purifying a tainted air, that of gun-powder is to be efteemed the beft; and it has this further good property, that it is entirely inoffenfive to the lungs The cafcarilla-bark, when burning, gives a moft agreeable fcent to the chamber of the fick; fo is at leaft an elegant prefervative, and may prevent

Febres prevent bad ſmells from taking effect. The ſteam of camphorated vinegar warmed, is ſtill more powerful for this purpoſe. But, beſides correcting the ill quality of the air, and purifying the chamber, another good effect is produced from ſuch ſteams and ſmoke as are inoffenſive to the lungs. As ſoon as the vapour becomes denſe, the nurſes and patients become deſirous of the admiſſion of freſh air by the door or windows. Now it is certain, that the air in the chambers of the ſick cannot be too often changed, provided the patient be well covered, and the curtains of his bed, if neceſſary, be drawn cloſe. No argument is ſo forcible to obviate the danger of foul air in a room or ward (occaſioned by the obſtinacy of nurſes or relations), as ordering it to be frequently fumigated or ſmoked: A practice more frequent in other countries than in this, but of great benefit to the ſick.

Laſtly, with regard to the method of purifying goods, moveables, clothes, &c. which are ſuppoſed to harbour infection, it muſt be obſerved, that the uſual cuſtom of only unpacking and expoſing ſuch materials to the open air, is in many inſtances inſufficient to deſtroy the latent ſeeds of diſeaſe. It is certain indeed, that in moſt caſes the contagious particles are more readily and fatally communicated from the clothes of a ſick perſon than from his body. The ſpreading abroad, therefore, of contaminated clothes to dry or to be aired, without a previous fumigation of them, may be of dangerous and fatal conſequence. All ſuch ſuſpected ſubſtances ſhould be firſt fumigated in a cloſe place, and in the ſame manner as an infected chamber, after which they may be ſpread abroad and expoſed to the air. In infectious diſeaſes, eſpecially fevers, the linen of the ſick, or ſuch clothes about them as will admit of being waſhed, ought never at firſt to be put in warm water, as it is dangerous to receive the ſteam that may hence ariſe. It is neceſſary to ſteep them firſt either in cold water or in cold ſoap-lees for ſeveral hours, that the filth may be waſhed off.

We muſt now proceed to give an account of the method of cure, after theſe methods of preventing the infection from being received into the body have either been neglected or proved ineffectual. Here it is of the utmoſt importance to take the diſeaſe in the very beginning, before it hath time to corrupt the fluids to ſuch a degree as to endanger life. In theſe ſlight degrees of infection, a vomit properly adminiſtered, eſpecially if ſucceeded by a bliſter, never fails to remove the diſorder, and prevent the fever which would otherwiſe unavoidably follow. Of this Dr Lind gives the following inſtances. A lady afflicted with the bilious cholic, had intolerably fetid diſcharges of corrupted matters upwards and downwards. A gentlewoman, only in paſſing the room, was immediately ſeized with a retching and ſickneſs, which continued 24 hours. The nurſe who attended was ſuddenly ſeized with a giddineſs and vomiting from the bad ſmell, which, as ſhe expreſſed it, reached into her ſtomach. The vomiting became more ſevere at night, accompanied with a purging and frequent ſhiverings. By means of an emetic both evacuations were ſtopped: notwithſtanding which, for ſome days afterwards, ſhe continued to have frequent tremors, and a violent head-ach, with a low irregular pulſe; and did not recover ſo ſoon as the patient.

Such ſlight degrees of infection have been often obſerved to be derived from patients of a groſs habit of body, when labouring under inflammatory diſtempers, and even other complaints. A man was ſent to Haſlar Hoſpital, ſuppoſed to have a fever. He was furiouſly delirious, with a quick full pulſe. Notwithſtanding plentiful evacuations, this delirium continued for two months with ſhort intervals; when the caſe was found to be plainly maniacal. A nurſe, upon raiſing this perſon up in her arms, perceived an intolerably bad ſmell, and was inſtantly ſeized with ſhiverings, ſickneſs, and head-ach. Finding herſelf very ill, ſhe took a vomit in ſix hours afterwards, and paſſed the night in profuſe ſweats by means of a ſudorific draught. Next morning the violence of the head-ach was but little abated; upon every attempt to move, ſhe complained of a burning heat and pain in her forehead, and became giddy. Her inclination to drink was frequent, and her pulſe low and quick. A bliſter was immediately applied to the back; as ſoon as the bliſter took effect, the head-ach and thirſt entirely left her, and the pulſe was calm. Next day ſhe aroſe and was well.

Typhus. Many ſimilar inſtances of infection have been obſerved from putting the dead into their coffins. In particular, one man, who, from performing that duty to his meſſmate, was ſo ill, even after the operation of the vomit, as to require a bliſter. In the courſe of one week two nurſes were infected by a perſon in the ſmall-pox. Both were ſeized in like manner with ſhiverings, ſickneſs, and head-ach; the one upon receiving the patient's breath, the other upon making his bed. In one, a pain darted into her breaſt; in the other, into the breaſt and in the ſmall of the back. The complaints of the former were ſpeedily removed by a vomit, though ſhe continued to have irregular returns of ſhiverings for three days afterwards. But in the latter, though the head-ach, ſickneſs, and rigors, were greatly abated by the vomit, yet a conſtant heat and thirſt, with a low pulſe, and a violent pain in the breaſt, indicated the neceſſity of applying a bliſter to the affected parts, which next morning removed all her complaints.

A perſon is often immediately ſenſible of his having received an infection from the firſt attack: they generally compare the firſt impreſſion to an earthy, diſagreeable ſmell, reaching down, as they expreſs it, into their ſtomach, as from a grave newly opened, but not quite ſo raw as the cadaverous ſtench; and the effects of it, ſhivering and ſickneſs, are inſtantaneous. It is a ſmell difficult to deſcribe; but is well known to the nurſes and attendants about the ſick, as it uſually accompanies fevers of extreme malignity, and, with the peculiar diſcharges from the bliſtered parts, may be reckoned among the moſt conſtant ſymptoms of a bad fever. Some compare the ſmell to that of rotten ſtraw. It often reſembles the diſagreeable ſmell of a perſon labouring under the confluent ſmall-pox at their turn, though not ſo ſtrong. One perſon, on receiving the infection, was ſenſible of ſomething like an electric ſhock through his body. But many are not ſenſible of any effect from an infection at firſt; and an infection from a fever will ſometimes continue for many days, nay, weeks, diſcovering itſelf chiefly by irregular ſhiverings, ſometimes ſo ſevere as to oblige the patients to have re-

Febres recourse to their beds once or twice a-day; sometimes every other day. Among a number thus affected, it also appears, that such as are put into unseasoned chambers, or have sat down on the cold ground, lain in raw damp apartments, &c. are immediately seized with a sickness at stomach, sometimes with a dangerous purging, and often with fevers accompanied with bad symptoms, which others have entirely escaped.

It now remains to consider the proper method of curing putrid fevers, on the supposition that the infection has been allowed to operate till the blood becomes radically tainted, and of consequence the nervous system affected to such a degree, that its power cannot be restored by any of the simple medicines above-mentioned. Here all authors agree, that a change of air, when it can be effected, is absolutely necessary, and often contributes more towards the removing of the disease than all the medicines that can be exhibited. The utility of this change will appear from what hath been formerly said; and we shall only further allege one instance from Dr Lind, in which the effects of bad air appear to a degree almost incredible. "It is remarkable (says he), that in the last war, the English ships which touched at Batavia suffered more by the malignant and fatal diseases of that climate, than they did in any other part of India, if we except a fatal scurvy which once raged in that fleet at sea. Soon after the capture of Manila, the Falmouth, a ship of 50 guns, went to Batavia, where she remained from the latter end of July to the latter end of January; during which time she buried 100 soldiers of the 79th regiment and 75 of the ships company; not one person in the ship having escaped a fit of sickness, except her commander Captain Brereton. The Panther, a ship of 60 guns, was there in the years 1762 and 1764; and both times during the rainy season. In the former of these years, she buried 70 of her men; and 92 of them were very ill when she left the place In the year 1764, during a short stay, 25 of her men died. The Medway, which was in company with her, lost also a great number of men. Nor was the sickness at that time confined to the ships; the whole city afforded a scene of disease and death: streets crowded with funerals, bells tolling from morning to night, and horses jaded with dragging the dead in hearses to their graves. At that time a slight cut of the skin, the least scratch of a nail, or the most inconsiderable wound, turned quickly to a spreading putrid ulcer, which in 24 hours consumed the flesh even to the bone This fact is so extraordinary, that, upon a single testimony, credit would hardly be given to it; yet on board the Medway and Panther they had the most fatal experience of it, and suffered much from it."

But where a change of air is impracticable or ineffectual, and where the fever hath already made some progress, Sir John Pringle generally took away some blood if the pulse was full When the symptoms run high, a plentiful evacuation of that kind seemed indicated; yet it was observed that large bleedings generally did harm, by sinking the pulse, and affecting the head. Nor was a moderate bleeding to be repeated without caution; even those whose blood was sizy, unless their lungs were inflamed, were the worse for a second bleeding. If the head only suffered, it was much safer to use leeches than to open a vein in the arm; but in the delirium with a sunk pulse, even leeches were hurtful. Many recovered without letting blood, but few who lost much of it.

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Vomits also must be used with caution; for though they may be of use by way of prevention, yet in the advanced state of the disease, when the patient has all along complained of a sickness at stomach, they are evidently unsafe. Here the antiseptic quality of fixed air is of much use, and the neutral draughts given in the act of effervescence are generally attended with happy effects. Nay, clysters of fixed air itself have been found very serviceable. Even in very bad stages of the distemper, where a putrid and colliquative looseness has taken place, clysters of fixed air have been known to alleviate the symptoms. We must not, however, put too much confidence in medicines of this kind. Mild astringent cordials, especially wine and Peruvian bark, are the only resources in these disorders. Concerning the former, Sir John Pringle observes, in the low state of these fevers, and in great sinkings, which either come after unseasonable bleedings or long want of nourishment, it was a most grateful and efficacious cordial, to which nothing was comparable. The common men had an allowance, from a quarter to half a pint in a day, of a strong kind, made into whey, or added to the panada which was their ordinary food. But to others out of the hospital, he usually prescribed Rhenish or a small French wine, whereof some consumed near a quart per day, and part of that undiluted. Nay, so great was the virtue of wine in this stage of the fever, that several were known to recover from the lowest condition, when, refusing the bark on account of its taste, they took nothing but a little panada with wine and a volatile diaphoretic mixture every two or three hours by turns. Perhaps there is no rule more necessary in this state, than not to let the patient when low remain long without taking something cordial and nourishing; as many have been observed past recovery, by being suffered to pass a whole night without any support about the time of the crisis. In the advanced state of this fever the sick are remarkably low; and therefore Hoffman advises in such cases, that they should be constantly kept in bed, and not permitted even to sit up in it. In the last stage of this fever, as well as in that of the sea-scurvy, it would seem that the force of the heart was too small to convey the blood to the brain, except when the body is in an horizontal posture.

But, however necessary wine and the bark may be in the low stage of this fever, we must remember, that these remedies are to be administered only as antiseptics and supporters of the *vis vitæ*, without aiming at thoroughly raising the pulse or relieving the head, or at forcing a sweat by them, before nature points that way, and which Sir John Pringle seldom observed before the 14th day. For though the patient may die before that time if he has been largely bled, or if the cordial medicines have been given him too freely, yet such means as he made use of were not powerful enough to bring on a crisis sooner.

In the low state of the hospital-fever, a stupor was a constant attendant, which was very apt, in the evening, to change to a slight delirium. If this was all, as being in the common course, nothing was done. But if the delirium increased upon using wine, if the

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eyes looked wild, or the voice became quick, there was reason to apprehend a phrenitis; and accordingly it was observed, that at such times all internal heating medicines aggravated the symptoms; and in these cases blisters were of the greatest service. Fomentations of vinegar and warm water for the feet, our author is of opinion would answer better than either sinapisms or blisters, provided they were long enough and often enough applied In the inflammatory fevers, he has known these fomentations have little effect for the first hour, and yet succeed afterwards. For internal medicine, the bark was omitted for some time, but the patient was continued with an acidulated drink, *viz.* barley-water and vinegar; and treated also with camphire, *pulvis contrayervæ compositus*, and nitre, as was usual in the beginning of the fever. If the delirium was of the low kind, a decoction of the bark and wine were the only remedies: for in no instance was the delirium perfectly removed till the time of the crisis. It must also be observed, that a delirium may arise in putrid fevers from two opposite errors; one from large and repeated bleedings, and the other from wine and the cordial medicines being taken too early. It appears therefore how nice the principles are that regard the cure; as neither a hot nor a cool regimen will answer with every patient, or in every state of the disease.

If a diarrhœa came on in the decline of the fever, it was moderated, but not suppressed, by adding an opiate to the usual medicines. For though the looseness may be considered as critical; yet as the sick were too low to bear evacuations, there was a necessity for restraining it in some measure; and it has often been observed, that when it has been treated in this manner, about the usual time of the crisis, the patient has fallen into a gentle sweat, which has carried off the disease. In the worst cases of this fever, and especially when it coincides with the dysentery, the stools are frequently bloody; in which dangerous state, if any thing could be done, it was attempted by medicines of the same kind. In proportion to the putrid nature of the stools, opiates and astringents were used with the greater caution.

If the disease terminate in a suppuration upon one of the parotid glands (for the gland itself does not suppurate), the abscess was opened without waiting for a fluctuation, which might never happen; the pus being often here so viscid, that after it was ripe the part felt nearly as hard as if the suppuration had not begun.

Almost every patient, after the fever, complained of want of rest, frequently of a vertigo or confusion of the head, of a continuation of the deafness, or of other symptoms commonly called *nervous*. An opiate was then given at night; and in the day some strengthening medicines, such as the bark and the elixir of vitriol. In these cases, the bark was found not only to be the best strengthener, but the surest preservative against a return of the disease. For this last intention the convalescent was ordered about three drachms a-day for six or seven days together; and afterwards, if he remained longer in the hospital, some smaller quantity daily. But if there was any appearance of a hectic fever from an inward abscess, the case was treated accordingly. Upon comparing some of the remaining symptoms of those who recovered, with the condition of the brain in those who died and were opened, Sir John Pringle was induced to think, that some part even of that substance might suppurate, and yet the person recover.

Sometimes the patient falls into an irregular intermittent; which, if not of a hectic nature from an internal abscess, may proceed from neglecting to clear the *primæ viæ*. For it is easy to conceive, that after a long fever of such a putrid nature, often attended with langour of the bowels, the fæces may be so much accumulated, and so corrupted, as to occasion new disorders. In such cases, after proper evacuation by a purge, the bark was almost an infallible remedy.

The *Yellow* Fever.

Typhus cum flavedine cutis.
Typhus icteroides, *Sauv.* sp. 7.
Febris flava Indiæ Occidentalis, Warren. Malignant fever of Barbadoes, *Hillary's* Diseases of Barbadoes. *Lining* on the yellow fever of South Carolina, Edin. phys. and liter. Essays, vol. ii. *Mackittrick* de febre flava Indiæ Occidentalis, Edin. 1766. 168

Description. This is one of the most fatal diseases to which the inhabitants of warm climates are subject, and is the same with that called, from one of its worst symptoms, the *black vomit*, which is so terribly destructive in some of the warm parts of America, particularly at Carthagena. According to Dr Hillary, the yellow or putrid bilious fever most commonly seizes the patient at first with a faintness, then with a sickness at stomach, accompanied mostly with a giddiness of the head; soon after with a slight chillness and horror, very rarely with a rigor, which is soon followed by a violent heat and high fever, attended with acute darting pains in the head and back. A flushing in the face, with an inflamed redness and a burning heat in the eyes, great anxiety and oppression about the præcordia, are the pathognomonic signs of the distemper; especially when attended with sickness at stomach, violent retchings, and bilious yellow vomitings, with frequent sighing. The pulse is now generally very quick, high, soft, and sometimes throbbing, but never hard: in some it is very quick, soft, low, and oppressed; the respiration quick, full, and sometimes difficult; the skin very hot, and sometimes dry, though more frequently moist. Blood taken from the patient, even at the very beginning of the disease, is often of an exceeding florid red colour; much rarefied and thin, and without the least appearance of size; and the crassamentum, when it has stood till it is cold, will scarce cohere, but fluctuates; the serum is very yellow.

Most of the abovementioned symptoms continually increase, and are much aggravated: the retching and vomiting become almost incessant; the anxiety great, and sighing frequent; great restlessness; continual tossing; no ease in any posture; little sleep, and that disturbed and uneasy, and without any refreshment to the sick: and when they are fainting, they turn yellow about the face and neck, instead of turning pale; and as the fainting goes off, they recover their natural colour. These symptoms generally continue to the third day, though sometimes not longer than the first or second, in others to the end of the fourth: the first shows the greater dissolution of the blood, and the greater malignity of the disease; the last, the contrary; which

which the improper manner of treating the disease sometimes hastens and increases, or the proper method retards. This may be called the first stadium of the disease, and generally ends on the third day.

Blood taken from the sick on the second or third day, is much more dissolved, the serum more yellow, and the crassamentum florid, loose, scarce cohering, but undulates like sizy water when shaken, and sometimes has dark blackish spots on its surface, showing a strong gangrenescent diathesis.

About the third day, the pulse, which was quick and full before, now generally sinks greatly, and become very low: though sometimes it remains very quick, yet in others it is not much quicker than when the patient is in health, but is always low; the vomiting becomes almost incessant if not so before, and the matter thrown up is black; the patient then becomes comatose, with interrupted deliria. The thirst in some is very great, in others but little; the pulse still low and quick, attended with cold clammy sweats, and sometimes with deliquia. The eyes, which were inflamed and red before, and began to be of a more duskish colour, now turn yellow; and this yellowness also soon after appears round the mouth, eyes, temples, and neck, and in a short time diffuses itself all over the body. But this yellowness is so far from being always an encouraging prognostic, as some would have it, that it most commonly proves a mortal symptom. Sometimes indeed, though seldom, this suffusion of bile upon the surface has proved critical; but then it did not come on till the eighth or ninth day, nor appear till the coma and all the other bad symptoms began to abate; and then in proportion as the yellowness increases, all the bad symptoms decrease. But the case is most commonly quite the reverse; especially when the yellowness comes soon on: and then it is not only symptomatical, but ushers in the most fatal symptoms of the disease, viz. a deep coma, a low, vermicular, and intermitting pulse, great hæmorrhages from various parts of the body, a delirium with laborious and interrupted respiration, great anxiety, deep sighing, restlessness, a subsultus tendinum, coldness of the extreme parts first, and then all over the body, a faltering of the speech, tremors, and convulsions, which are soon after followed by death. So that from the first appearance of the yellowness we may say the patient is in the last stage of the disease, whether it terminates in death or recovery.

It has been observed, that, in some strong sanguine constitutions, when the patients have not been bled to a sufficient quantity in the beginning of the disease, the pulse has continued full, strong, and rapid, but never hard; the face flushed, eyes inflamed; the tongue dry, with great thirst and heat, till the second or last stage of the fever is come on, when the pulse has suddenly sunk, and death soon after ensued. Yet in others, who seemed to be of a plethoric habit, the tongue has been moist all along, though they have been delirious most of the time, and the heat of their skin and the strength and quickness of their pulse have continued, after the first stage of the disease was over, pretty near to that of their natural state in health, till within a few hours of their death; and when they have had a coma on them, one who is not well acquainted with the nature of this disease would, from their pulse, heat, breathing, and other symptoms, have taken them to be in a natural sleep. Others, when the pulse has begun to sink, and the fatal period seemed to be just approaching, to the great surprise of all present have recovered their senses, sat up, and talked pretty cheerfully for an hour or two, and in the midst of this seeming security have been suddenly seized with convulsions, which carried them off immediately.

In the latter stage of this fever, the blood is so attenuated and dissolved, that we frequently see it flowing not only out of the nose and mouth, but from the eyes, and even through the pores of the skin; also great quantities of black, half-baked, or half-mortified blood, are frequently voided both by vomiting and by stool, with great quantities of yellow and blackish putrid bile by the same passages; and the urine, which was before of a high icteritious colour, is now almost black, and is frequently mixed with a considerable quantity of half-dissolved blood. The pulse, which was much sunk before, now becomes very low, unequal, and intermitting; the breathing difficult and laborious; and the anxiety inexpressible: an oppression with a burning heat about the præcordia comes on, tho' the extremities are cold, and often covered with cold clammy sweats: a constant delirium follows; and then a total loss of the outward senses as well as the judgement, with livid spots in many parts of the body, especially about the præcordia; and sometimes gangrenes in other parts of the body, which are very soon succeeded by death.

In a short time after death, the body appears much more full of livid, large, mortified spots, particularly about the præcordia and hypochondres, especially the right; which parts seem, even from the first seizure, to be the principal seat of this terrible disease; and, upon opening the bodies of those who die of it, we generally find the gall-bladder and biliary ducts turgid, and filled with a putrid blackish bile; and the liver, stomach, and adjoining parts, full of livid or blackish mortified spots; and the whole corpse soon putrifies after death, and can be kept but a few hours above ground.

Dr Lind is of opinion, that the remarkable dissolution of the blood, the violent hæmorrhages, black vomit, and the other symptoms which characterize the yellow fever, are only accidental appearances in the common fever of the West Indies; that they are to be esteemed merely as adventitious, in the same manner as purple spots and bloody urine are in the small-pox, or as an hiccough in the dysentery: like these they only appear when the disease is attended with a high degree of malignity, and therefore always indicate great danger. This opinion, he thinks, is confirmed by an observation of Dr Wind's, that in 1750 the crew of a Dutch ship of war were distressed by the yellow fever, accompanied with the black vomit; but when the ship left the harbour, and changed the noxious land-air for one more healthy, the fever continued, but was not accompanied with the black vomit.

Diseases similar to this fever, Dr Lind informs us, may arise in any part of the world where the air is intensely hot and unwholesome; and therefore he treats as chimerical the notion of its being imported from one part of the world to another. An example of this happened at Cadiz in Spain, in the months of September and October 1764, when exceffive heat, and want of rain for fome months, gave rife to violent, epidemic, bilious diforders, refembling thofe of the Weft Indies, of which 100 perfons often died in a day. At this time the winds blew principally from the fouth, and after fun-fet there fell an unufual and very heavy dew.

This difeafe began commonly with alternate flight chills and heats, naufea, pains of the head, back, loins, and at the pit of the ftomach. Thefe fymptoms were often followed, in lefs than 24 hours, with violent retchings, and vomiting of a green or yellow bile, the fmell of which was very offenfive. Some threw up an humour as black as ink, and died foon after in violent convulfions and in a cold fweat. The pulfe was fometimes funk, fometimes quick, but often varying. After the firft day, the furface of the body was generally either cold, or dry and parched. The head-ach and ftupor often ended in a furious delirium, which quickly proved fatal. The dead bodies having been examined by order of the court of Madrid, the ftomach, mefentery, and inteftines, were found covered with gangrenous fpots. The orifice of the ftomach appeared to have been greatly affected, the fpots upon it being ulcerated. The liver and lungs feemed to be putrid, both from their texture and colour. The ftomach contained a quantity of an atrabilious liquor, which, when poured on the ground, produced a fenfible effervefcence; and, when mixed with fpirit of vitriol, a violent ebullition enfued. The dead bodies fo quickly turned putrid, that at the end of fix hours their fetor was intolerable; and, in fome of them, worms were found already lodged in the ftomach. His Majefty's fhip the Tweed being at that time in Cadiz bay, feveral of her men were taken ill when on fhore, but by being carried on board all of them recovered. Neither did the black vomit, or any other deadly fymptom of that fever, make its appearance in any of the fhips.

It has been a matter of much difpute, whether the yellow fever is of an infectious nature or not. Some time ago it became an object of confideration before the Right Hon. the Lords Commiffioners of Trade and Plantations, where it was urged, among other reafons, for not removing the feat of government and juftice in the ifland of Jamaica from Spanifh Town to Kingfton, that there was danger from Greenwich hofpital, fituated near Kingfton, of an infection from the yellow fever being frequently communicated to that town. On this affair a phyfician was confulted, who had long practifed in that ifland, and who gave it as his opinion, that from the yellow fever in that ifland there was no infection. This was the opinion not only of that gentleman, but of many others who had an opportunity of being well acquainted with this fever in Jamaica. Dr Lind, however, gives a remarkable inftance of its being of an infectious nature.—A gentleman dying at Barbadoes of a yellow fever, his wearing apparel and linen, packed up in a cheft, were fent to his friends at Philadelphia; where, upon opening the cheft, the family was taken ill; and the clothes being unluckily hung abroad to be aired, they prefently diffufed the contagion of the yellow fever over the whole town, by which 200 perfons died. Thefe contradictions, Dr Lind thinks, can only be reconciled, by fuppofing the yellow fever in the Weft Indies to be fometimes of an infectious nature and fometimes not.

In the defcription of the fame fever by Dr Lining, as it appears in South Carolina, there are feveral particulars confiderably different from that by Dr Hillary. According to the former, people complained for a day or two before the attack, of a head-ach, pain in the loins and extremities, efpecially in the knees and calves of the legs, lofs of appetite, debility, and a fpontaneous laffitude. Some, however, were feized fuddenly, without any fuch previous fymptoms. After a chillinefs and horror, with which this difeafe generally invades, a fever fucceeded. The pulfe was very frequent, till near the termination of the fever, and was generally full, hard, and confequently ftrong: in fome, it was fmall and hard; in others, foft and fmall; but in all thofe cafes, it frequently varied in its fullnefs and hardnefs. Towards the termination of the fever, the pulfe became fmaller, harder, and lefs frequent. In fome there was a remarkable throbbing in the carotids and in the hypochondria; in the latter of which it was fometimes fo great, that it caufed a conftant tremulous motion of the abdomen. The heat generally did not exceed 102 degrees of Fahrenheit's thermometer; in fome it was lefs; it varied frequently, and was commonly nearly equal in all parts, the heat about the præcordia being feldom more intenfe than in the extremities when thefe were kept covered. In the firft day of the difeafe, fome had frequent returns of a fenfe of chillinefs, though there was not any abatement of their heat. In a few, there happened fo great a remiffion of the heat for fome hours, when at the fame time the pulfe was foft and lefs frequent, and the fkin fo moift, that one from thefe circumftances might reafonably have hoped that the fever would only prove a remittent or intermittent. About the end of the fecond day, the heat began to abate. The fkin was fometimes (though rarely) dry; but oftener, and indeed generally, it was moift, and difpofed to fweat. On the firft day, the fweating was commonly profufe and general; on the fecond day, it was more moderate: but on both thefe, there happened frequent and fhort remiffions of the fweatings; at which times the febrile heat increafed, and the patient became more uneafy. On the third day, the difpofition to fweat was fo much abated, that the fkin was generally dry; only the forehead and backs of the hands continued moift. The refpiration was by no means frequent or difficult; but was foon accelerated by motion, or the fatigue of drinking a cup of any liquid. The tongue was moift, rough, and white, even to its tip and edges. On the fecond day, its middle in fome was brown. On the third day, the whitenefs and roughnefs of the tongue began to abate. The thirft in very few was great. A naufea, vomiting, or frequent retchings to vomit, efpecially after the exhibition of either medicines or food, came on generally the third day, as the fever began to leffen; or rather as the fulnefs of the pulfe, heat, and difpofition to fweat, began to abate. Some indeed, but very few, on the firft day, had a vomiting, either bilious or phlegmatic. Very few complained of anxiety or oppreffion about the præcordia

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dia or hypochondria, nor was there any tenfion or hardnefs about the latter. On the firft day they generally dozed much, but were afterwards very watchful. Reftleffnefs and almoft continual jactations came on the fecond day. A great defpondeney attended the fick, and the ftrength was greatly proftrated from the firft attack. The pain in the head, loins, &c. of which they had complained before the attack, were greatly increafed, and in fome the pain in the forehead was very acute and darting; but thofe pains went generally off the fecond day. The face was flufhed; and the eyes were hot, inflamed, and unable to bear much light. On the firft day, many of them at times were a little delirious, but afterwards not until the recefs of the fever. The blood faved at venefection had not any inflammatory cruft; in warm weather, it was florid like arterial blood, and continued in one foft homogeneous-like mafs, without any feparation of the ferum after it was cold. When there was any feparation, the craffamentum was of a very lax texture. The ftools, after the firft day, were fetid, inclined to a black colour, and were very rarely bilious, foft, or liquid, excepting when forced by art; for an obftinate coftivenefs attended the febrile ftate. The urine was difcharged in a large quantity, was pale, fometimes limpid, and rarely of a higher than a ftraw colour, except when the weather was very warm, and then it was more faturated, of a deep colour, and difcharged in fmaller quantities. It had a large cloud, except when it was very pale or limpid; but more generally it had a copious white fediment, even on the firft day of the fever. On the fecond day, the urine continued to be difcharged very copioufly; in fome it was then turbid, and depofited a more copious fediment than on the firft day: this fediment was fometimes of a brownifh colour; in which cafe it was generally followed by bloody urine, either about the end of the fecond or beginning of the third day.—The colour and quantity of the urine, difcharged in equal times, were remarkably variable, being now limpid, then of a deeper colour, now difcharged in a larger, then in a fmaller quantity; which could not be afcribed to any change made either in the quantity or quality of the drink, &c.

The fever accompanied with thofe fymptoms terminated on the third day, or generally in lefs than 72 hours from the firft attack, not by any affimilation or coction and excretion of the morbid matter: for if by the latter, there would have been fome critical difcharge by fweat, urine, ftool, or otherwife, none of which happened; and if by the former, nothing then would have remained but great debility. This fever, however, did not terminate in either of thefe falutary ways, excepting in fome, who were happy enough to have the difeafe conquered in the beginning by proper evacuations, and by keeping up a plentiful fweat, till the total folution of the fever, by proper mild diaphoretics and diluents. But thofe who had not that good fortune, however tranquil things might appear at this period (as great debility, and a little yellownefs in the white of the eyes, feemed then to be the chief complaint, excepting when the vomiting continued), yet the face of affairs was quickly changed: for this period was foon fucceeded by the fecond *ftadium*; a ftate, though without any fever, much more terrible than the firft: the fymptoms in which were the following. The pulfe, immediately after the recefs of the fever, was very little more frequent than in health, but hard and fmall. However, though it continued fmall, it became, foon afterwards, flower and very foft; and this foftnefs of the pulfe remained as long as the pulfe could be felt. In many, in this ftage of the difeafe, the pulfe gradually fubfided, until it became fcarce perceptible; and this, notwithftanding all the means ufed to fupport and fill it; and when this was the cafe, the icteritious-like fuffufion, the vomiting, delirium, reftleffnefs, &c. increafed to a great degree. In fome, the pulfe, after being exceedingly fmall and fcarce perceptible, recovered confiderably its fullnefs; but that favourable appearance was generally of but fhort continuance. The heat did not exceed the natural animal-heat; and when the pulfe fubfided, the fkin became cold, and the face, breaft, and extremities acquired fomewhat of a livid colour. The fkin was dry when the weather was cold, but was moift and clammy when the weather was hot. The refpiration was natural, or rather flow. The tongue was moift, and much cleaner than in the former ftage; its tip and edges, as alfo the gums and lips, were of a more florid red colour than ufual. Very few complained of thirft, though they had a great defire for cold liquors. The vomiting or retching to vomit increafed, and in fome was fo conftant that neither medicines nor aliment of any kind were retained. Some vomited blood; others only what was laft exhibited, mixed with phlegm; and others again had what is called the *black vomit* (A). The retching to vomit continued a longer or fhorter time according to the ftate of the pulfe; for as that became fuller, and the heat greater, the retching to vomit abated, and *è contra*. The inquietude was very obftinate; and when they dozed, their flumbers were but fhort and unrefrefhing. There were fome who were drowfy; but thefe always awaked, after the fhorteft flumbers, with a great dejection of fpirits and ftrength.

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(A) That which is called the *black vomit* at firft fight appears to be black; but on a more careful examination, it was obferved that this colour proceeded from a great quantity of fmall flakey black fubftances which floated in the liquor thrown up by vomiting; but the colour of this liquor was much the fame with that which the patient had laft drank, and was by no means black. Thofe black flakey fubftances are the bile mixed with, or adhering to the mucus which lined the ftomach. For, upon diffection of thofe who died of this difeafe, it was always obferved that the mucus of the ftomach was abraded, and the bile in its cyftis was black and fometimes very vifcid. In a lad who died of this difeafe in the beginning of the fourth day, and who was immediately opened, the bile was not only black, but had the confiftence of thick venice-turpentine, and was exceedingly tough. On the infide of the ftomach, there were feveral carbuncles or gangrenous fpecks. And in all thofe who were diffected, and had died of this difeafe, the fame appearances were not only always obferved, but likewife the blood was very fluid, and the veffels of the vifcera were much diftended.

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The jactations or restlessness were surprising: it was frequently scarce possible to keep the patients in bed; though, at the same time, they did not complain of any anxiety or uneasiness; but if asked how they did, the reply was, *Very well.* The debility was so great, that, if the patient was raised erect in the bed, or, in some, if the head was only raised from the pillow, while a cup of drink was given, the pulse sunk immediately, and became sometimes so small, that it could scarce be felt; at this time, they became cold, as in a horripilatio, but without the anserine like skin: their lips and skin, especially about the neck, face, and extremities, together with their nails, acquired a livid colour. The delirium returned and increased; it was generally constant in those whose pulse was small and subsiding. The inflammation of the tunica conjunctiva or white of the eyes increased much, but without pain. A yellowness in the white of the eyes, if it did not appear before in the febrile state, became now very observable, and that icteritious-like colour was soon diffused over the whole surface of the body, and was continually acquiring a deeper saffron-like colour. In some indeed no yellowness was observable, excepting in the white of the eyes, until a little before death, when it increased very quickly, especially about the breast and neck. There were many small specks, not raised above the skin, which appeared very thick in the breast and neck, but less so in the extremities, and were of a scarlet, purple, or livid colour. In women the menstrua flowed, and sometimes excessively, though not at their regular period.

There was such a putrid dissolution of the blood in this stadium of the disease, that, besides the vomiting of blood formerly mentioned, and the bloody urine soon to be taken notice of, there were hæmorrhagies from the nose, mouth, ears, eyes, and from the parts which were blistered with cantharides. Nay, in the year 1739 and 1745, there were one or two instances of an hæmorrhagy from the skin, without any apparent puncture or loss of any part of the scarf-skin.

An obstinate costiveness continued in some; in others, the stools were frequent and loose; in some they were black, liquid, large, and greatly fatiguing; in others, when the stools were moderate, even though they were black, they gave great relief; in others, again, the stools nearly resembled tar in smoothness, tenacity, colour, and consistence.

The urine was discharged in a large quantity, in proportion to the drink retained by the patient: it was pale if the patient was not yellow; but if yellow, then it was of a deep saffron-colour: in either case, it had a sediment, or at least a large cloud, which remained at the bottom of the glass; in some, it was very turbid; in others it was bloody: and the quantity of blood discharged with the urine bore always some proportion to the state of the pulse; when that became fuller, the quantity of blood in the urine was diminished; when the pulse subsided, the bloody urine increased, and even returned after it had ceased some days, soon after the pulse became smaller. This stage of the disease continued sometimes seven or eight days before the patient died.

When this stadium of the disease terminated in health, it was by a recess or abatement of the vomiting, hæmorrhagies, delirium, inquietude, jactations, and icteritious-like suffusion of the skin and white of the eyes; while, at the same time, the pulse became fuller, and the patient gained strength, which, after this disease, was very slowly. But when it terminated in death, those symptoms not only continued, but sooner or later increased in violence, and were succeeded with the following, which may be termed the third *stadium* of the disease, which quickly ended in death. The pulse, though soft, became exceedingly small and unequal; the extremities grew cold, clammy, and livid; the face and lips, in some, were flushed; in others, they were of a livid colour; the livid specks increased so fast, that in some the whole breast and neck appeared livid; the heart palpitated strongly; the heat about the præcordia increased much; the respiration became difficult, with frequent sighing; the patient now became anxious, and extremely restless; the sweat flowed from the face, neck, and breast; blood flowed from the mouth, or nose, or ears, and in some from all those parts at once; the deglutition became difficult; the hiccoughs and subsultus of the tendons came on, and were frequent; the patients trifled with their fingers, and picked the naps of the bed-clothes; they grew comatous, or were constantly delirious. In this terrible state, some continued eight, ten, or twelve hours before they died, even after they had been so long speechless, and without any perceptible pulsation of the arteries in the wrists; whereas, in all other acute diseases, after the pulse in the wrists ceases, death follows immediately. When the disease was very acute, violent convulsions seized the unhappy patient, and quickly brought this stadium to its fatal end. After death, the livid blotches increased fast, especially about the face, breast, and neck, and the putrefaction began very early, or rather increased very quickly.

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This was the progress of this terrible disease through its several stadia. But in hot weather, and when the symptoms in the first stage were very violent, it passed through those stages with such precipitation that there was but little opportunity of distinguishing its different stadia, the whole tragedy having been finished in less than 48 hours. It was remarkable, that, 1. The infection was increased by warm and lessened by cold weather. 2. The symptoms in the several stadia were more or less violent, according to the heat or coolness of the weather. In hot days, the symptoms were not only more violent, but in those who seemed in moderate weather to be on the recovery, or at least in no danger, the symptoms were all so greatly heightened, when the weather grew considerably warmer, as frequently to become fatal. In cool days, the symptoms were not only milder, but many who were apparently in great danger in hot days were saved from the very jaws of death by the weather becoming happily cooler. 3. The disease was generally more fatal to those who lay in small chambers not conveniently situated for the admission of fresh air, to those of an athletic and full habit, to strangers who were natives of a cold climate, to those who had the greatest dread of it, and to those who before the attack of the disease had overheated themselves by exercise in the sun, or by excessive drinking of strong liquors; either of which indeed

Febres indeed seemed to render the body more susceptible of the infection. Lastly, the disease proved most certainly fatal to valetudinarians, or to those who had been weakened by any previous disease.

Although from the description which has now been given of the yellow fever, it may appear to be in many particulars very different from the remittent fever of warm climates; yet it is the opinion of many late writers of great accuracy, particularly of Dr John Hunter in his Observations on the Diseases of the Army in Jamaica, that it is to be considered only as a more dangerous form of the same disease. And there can be no doubt that the remittent fever not only appears in different seasons and situations with very different degrees of severity; but also that while the remittent fever prevails in its usual form in the West India islands, some individuals, particularly those who are newly arrived, will be affected with very remarkable yellowness, as well as bilious and black vomitings.

Causes of, and persons subject to, this disease. The yellow fever attacks principally Europeans, especially those who have but lately arrived in the hot climates. Negroes are entirely exempt from it, though the mulattoes and tawnies are as liable to be seized with it as the whites themselves. The cause of the disease seems to be a particular kind of contagion; but Dr Lind seems to be of opinion, that the immediate cause of the symptoms is a disposition in the glutinous part of the blood to separate from the others, and to become purulent. In some persons who have been bled in the yellow fever, the blood hath been observed prodigiously viscid; the crassamentum covered with a yellow gluten half an inch in thickness, and impenetrable to the finger unless cut by the nail; the serum being at the same time of the consistence of a thin syrup, and of a deep yellow tinge. This serum tasted bitter, and was taken for a composition of soot. The appearances on dissection, with his conclusions from them, we shall give in his own words: "In a man who died on the eleventh day of a yellow fever, whose body emitted no bad smell 36 hours after death, and was still yellow, I found all the bowels of the abdomen sound; the liver and spleen were remarkably so; as also the stomach and intestines. There was no suffusion of the bile either in the intestines or stomach. The gall-bladder, of the natural size, contained the usual quantity of bile, somewhat thicker than common, and grumous(B).

"Upon examining further, this disease was found to have lain wholly on the left side, where, within the breast, was found near a quart of yellowish water, in which were many large flakes of yellowish gluten, appearing, by comparison, precisely the same with the thick pellicle which had covered the blood taken from his arm. These flakes bore in several places a resemblance to a membranous substance beginning to be converted into a purulent jelly. The pleura, both on its inside and outside, as also its continuation, the investing membrane of the lungs (which in some parts was greatly thickened), were covered with cakes of this gluten, hanging in some places loosely, in others adhering more strongly: and all in different states of yellow or purulent corruption. The right cavity of the breast, and all the other parts of his body, were found entirely free from disease.

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"His complaints had been chiefly in his breast; and a small quantity of blood, taken from him two days before his death, was covered with an impenetrable, yellow, thick gluten; the red portion below it being quite loose.

"In those fevers, I have also seen the disease entirely confined to the heart and pericardium. In one who died the tenth day of the fever, without having been yellow, a quantity of pus and purulent crusts were found mixed with the water of the pericardium. The heart in different places was excoriated; and, together with the inside of the pericardium, was lined with a thick membranous cake, similar to that already mentioned on the lungs and pleura. In some places this cake had a purulent, in others a gelatinous, appearance, exactly resembling the coagulum of the blood. His complaints had been, a great oppression on the breast, and an extreme difficulty of breathing. In a third person, who died on the thirteenth day of the fever, above two quarts of pus and purulent jelly were found in the cavity of the belly. The source of such an extraordinary quantity of matter was not from any preceding inflammation, nor any imposthume, that we could discover; but from innumerable ulcerations on the surface of the intestines, omentum, mesentery, and peritoneum. Neither did those ulcerations (or excoriations, as they rather appeared in several places) seem to be the primary fountains of the matter, but to have been occasioned by its acrimony.

"This purulent appearance seems to arise merely from an extravasation of one of the component parts of the blood, the gluten or coagulable lymph. Blood taken from persons in a fever, and frequently even from persons in perfect health, after standing in a clean vessel for a short time, commonly separates into three distinct portions; *viz.* the serum, or water of the blood, the red concreted mass, and a viscid pellicle termed the *size*, which spreads itself on the top of the red concretion. Some time ago, when making experiments with the blood taken from persons in the scurvy, I was surprised to find it often covered with that sizy crust. This induced me to extend my experiments to large quantities of blood from different subjects, which I had opportunities of inspecting at once in so large an hospital. For this purpose I one morning ordered ten patients in the scurvy to be bled, taking two ounces from each. A larger quantity was taken, for its inspection, from two men in health. That day I had occasion to prescribe bleeding to a woman in labour, two hours before her delivery; to a girl of sixteen years of age afflicted with a lunacy proceeding from the chlorosis; to three patients in the rheumatism; and to a person labouring under an obstruction of the liver.

1 "From

(B) In others who died in this yellow state, the bile in the gall-bladder was found of a thick ropy consistence like pitch, but the liver never appeared in the least affected. Dr Lind at first in several bodies opened the head only; but afterwards judged that all the cavities ought to be inspected.

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"From a nice comparison, and an examination of the different blood, I found in general, that the more size there was on the top, and the thicker and more viscid this white pellicle showed itself, the concretion below it was of a more loose coherence. This was not so observable when only some slight white streaks appeared on the top. But when much size had separated itself, the red mass became very soft at the bottom of the vessel, and less compact in its different parts, in proportion to their distance from the surface, towards which this whitish portion had ascended.

"From this and from other experiments it appears, that this crust or pellicle is the natural gluten or cement of the blood (called by some the *coagulable lymph*), which becomes strongly disposed, in certain circumstances and diseases, to separate itself. And whereas the serum and red concretion are easily incorporated together, it will be found, that this glue, after its separation, becomes immiscible with either. We have, by gentle drying, converted it into a perfectly tough elastic membrane; and, by the means of a small portion of the red mass being left adhering to it, into a substance resembling muscular flesh; and it is capable of undergoing various changes into corruption, in the same manner as either of these.

"Now, I can see no reason why this gluten, in its morbid state, may not separate itself from the circulating blood, and be deposited in the cavities of the body, as readily as the serum does in dropsies; the former having always a less disposition than the latter to incorporate with the mass.

"In dissecting persons who died of fevers in London and Minorca, and where no infection was suspected, appearances similar to these have also fallen under the inspection of those accurate anatomists Drs Hunter and Cleghorn. Hence it may be presumed very difficult to distinguish fevers that are produced by infection, from some others. I cannot, however, be induced to think, as those gentlemen seem to do, that these preternatural substances which were found in the cavities of the body are the consequence, but rather that they are the cause, of the inflammation and excoriations. I believe these substances to be at first diseased extravasated gluten, and conjecture their different states greatly to depend upon the different times at which they were deposited.

"I have remarked, in a variety of dead bodies, three different kinds of extravasation; these occurred in such as had died of the scurvy, of consumption, and of fevers. In the former of those diseases, red coagulated blood is found extravasated in almost all parts of the body, not only into the tela cellulosa, but into the bellies of the muscles, particularly of the legs and thighs, which often become quite stuffed and even distorted with large grumous masses. The intestines and mesentery are often spotted also with extravasated blood; and I have seen large ecchymoses on the stomach. Those appearances at first sight resembled so many distinct mortifications; and by this appearance some anatomists have been deceived; but, upon a nice examination, the texture of the parts is found to be sound and firm. There is likewise, in that disease, sometimes, an extravasation of water, chiefly collected in, and always when in the legs confined to, the tela cellulosa.

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"But whereas, in the limbs of scorbutic persons, it is extremely difficult to make a good dissection by reason of such quantities of extravasated blood that every where obstruct the operator; so, on the contrary, the lower extremities of those who have died consumptive, with swelled legs, are, of all other subjects, in the best state to afford a satisfactory view of the muscles. The water inclosed in their legs having insinuated itself, by passing the tela cellulosa, into the spaces between the muscles, the muscles are easily separated from each other; and their several origins and insertions may be distinctly traced by means of their having been cleansed and washed by the water in the investing cellular membrane. Thus there are extravasations of three sorts; *viz.* first, the grumous mass in the scurvy; and this I have often remarked where no serum was observed. Secondly, the serum alone in anasarcous swellings. The third and last is what was taken notice of in those who died of fevers, being the gluten of the blood, accompanied for the most part with some serum; both of them altogether confined in the large cavities of the body.

"I conjecture, that in those fevers there is always an ulcerous or purulent disposition in the blood; and that this gluten or coagulable lymph is greatly diseased. I have frequently seen it have a true purulent appearance soon after it was drawn off, when the patient seemed not very ill.

"And I further conjecture, that the mischief often lies within the breast; as also that the great benefit derived from the very early application of blisters, in a great measure flows from so many ulcerations and vents being timely provided for the free discharge of those purulent and tainted particles from the body.

"If an infection depends, as many have imagined, on the admission of certain foreign particles into the blood, this gluten seems to be its more immediate seat, and to be primarily affected by it; and a discharge of this, as though by washing those particles out of the body, tends in a great measure to remove the disease.

"It is an observation of the best practical writers, that issues and setons are most excellent preservatives against receiving an infection, nay, even that of the plague itself. And indeed a suppuration and plentiful discharge from a proper ulcer, whether produced by nature or by art, seems to open a channel the best appropriated for an exit out of the body to some of the most malignant poisons. Thus the most favourable crisis in the plague, and in most pestilential fevers, happens when nature excites tumors kindly suppurating in the groin or arm-pits, by whose beneficial and plentiful discharge the deadly poison is expelled from the constitution.

"I have observed it to be amongst the most certain characteristics of the worst fevers, that the blisters either do not rise and fill, or discharge such yellow, greenish, fetid, and highly offensive stuff, that even experienced nurses could give a pretty certain conjecture from the blisters, of the different degrees of malignity in the fever. We have more than once endeavoured to conceal the bad state of some patients in the hospital; but a discovery was always made of their condition in the wash-house, from the linen sent there stained with the discharges from the blistered parts.

And

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And indeed a careful inſpection of the ſtate and diſcharge from the bliſters, together with their effects, furniſhes us, in thoſe diſeaſes, with ſome of the moſt certain diagnoſtics of their nature and prognoſtics of their event."

Prognoſis. This diſtemper, where it attacks with violence, is generally fatal; the prognoſis therefore muſt be commonly unfavourable, and always uncertain; neither can any thing more be ſaid on this ſubject, than that an abatement of the ſymptoms already enumerated affords a favourable prognoſtic, and an increaſe of them the contrary.

Cure. The cure of this terrible diſeaſe, according to Dr Hillary, is very eaſy and ſimple. His indications are, 1. To moderate the too great and rapid motion of the fluids, and abate the too great heat and violence of the fever in the two firſt days of the diſeaſe, as much and as ſafely as we can. 2. To evacuate and carry out of the body as much of the putrid bile and other humours, and as expeditiouſly and ſafely as poſſible. 3. To put a ſtop to the putreſcent diſpoſition of the fluids, and to prevent the gangrenes from coming on, by ſuitable antiſeptics.

The firſt indication is anſwered by bleeding, which, in the firſt ſtage of this fever, is abſolutely neceſſary in ſome degree: the quantity to be taken away muſt be determined by the age and ſtrength of the patients, the degree of plethora, fulneſs of the pulſe, &c. When called in at the beginning, he orders 12, 14, 16, 18, or 20 ounces of blood to be taken away on the firſt or ſecond day: and if the patient's pulſe riſe after the firſt bleeding, or if the fever ſtill continue high and the pulſe full, he repeats the bleeding once on the days above-mentioned. But bleeding a third time is ſeldom or never required; neither is bleeding on the third day almoſt ever neceſſary; and when it is performed on that day, it ought to be done with the greateſt caution and judgment: neither ſhould a vein be opened after the third day in this fever, unleſs ſome very extraordinary ſymptoms and circumſtances require it; which ſeldom or never happen. On that day, indeed, the pulſe generally ſinks, and the blood is in ſuch a diſſolved ſtate, that bleeding muſt be accounted highly pernicious. Nevertheleſs, it is indiſpenſably neceſſary in the beginning of the diſtemper: and if omitted at that time, the violent heat and motion of the blood increaſe the putreſcence of the humours to ſuch a degree as to bring on the fatal conſequences much ſooner than would otherwiſe have happened.

After bleeding, we come to the ſecond indication of cure, namely, to evacuate as much of the bilious and putrid humours as ſoon and as ſafely as we can. The great irritation of the ſtomach, by the putrid bilious humours conſtantly attending this fever, with almoſt continual retchings and violent vomitings, ſeem to indicate the giving of an emetic: but the ſtomach is always obſerved to be ſo violently ſtimulated and irritated and moſt commonly inflamed by the acrimony of the putreſcent bile, that any emetic, even the moſt mild and gentle, given in the ſmalleſt doſe, brings on an inceſſant vomiting, which continues, in ſpite of all remedies, till a mortification and death enſue. Inſtead of this, it is proper to give large draughts of warm water, which, without any additional ſtimulus to the coats of the ſtomach, evacuates its acrid and putrid contents, commonly with great relief to the patient: the warm water alſo acts as an emollient fotus to the inflamed coats of the ſtomach; and thus abates the inflammation, and prevents the gangrene and mortification from coming on.

After the patient has by this means vomited ſeven or eight times or oftener, and diſcharged a great quantity of yellow and blackiſh bilious matter as they often do, a grain or a grain and a half of thebaic extract is given in order to procure ſome reſpite from the violent retching, vomiting, and anxiety. The perſon is deſired to take nothing into his ſtomach for two hours after this, by which means it is ſeldom or never rejected; and thus all the ſymptoms are conſiderably abated, the retching and vomiting either totally ceaſe or are very much leſſened, ſo that medicines may now be exhibited which the ſtomach would not have retained before. Theſe are cooling acid juleps, or other antiſeptic remedies; but neither nitre nor any of its preparations will commonly be found to ſtay on the ſtomach; nor are the nitrous medicines, or even the common anti-emetic draughts, proper to be given in this diſeaſe, even though they ſhould agree with the ſtomach, on account of their attenuating property.

If the patient has not a ſtool or two after drinking the warm water and vomiting, it is neceſſary to give a gentle purging clyſter; and when ſix or eight hours reſt have been obtained, a gentle antiphlogiſtic and antiſeptic purge, in order to evacuate by ſtool as much of the bilious matter as we poſſibly can. Or if the patient has a purging before, which ſometimes though very rarely happens, a doſe of toaſted rhubarb is given, and an antiſeptic anodyne after it has operated, to abate and check the too great purging, but not to ſtop it, as this evacuation has been always obſerved to be of ſervice, provided it be not too violent.

After this indication is completely anſwered, the next is to exhibit ſuch proper antiſeptic medicines as may ſtop the putreſcent diſpoſition of the fluids. Here the Peruvian bark would ſeem to be the moſt proper remedy; but unluckily the ſtomachs of the patients in this diſeaſe are ſo much irritated, and ſo apt to reject every thing, that the bark cannot be retained in any form whatever. In this caſe Dr Percival recommends columbo-root, the infuſion of which is found to be a powerful antiemetic and antiputreſcent medicine, and might perhaps ſo far alter the ſtate of the ſtomach as to make it bear the bark. Dr Hillary, however, who was ignorant of the virtues of columbo, ſubſtituted the *radix ſerpentariæ Virginianæ* with ſucceſs. A ſlight infuſion of this root not only ſat eaſily on the ſtomach of the patients, but moderately raiſed the pulſe and fever, both of which are now too low. The following receipt was found the moſt agreeable and efficacious.

℞. Rad. ſerpent. Virginian. ℥ii.
Croc. Ang. ʒſs. M. et infunde vaſe clauſo in aq. bul. q. per horam unam ut col. ℥vi. Adde aq. menth. ſimp. ℥ii. Vin. Maderienſ. ℥iv. Syr. croc. vel ſyr. e mecon. ℥i. Elix. vitriol. acid. q. ſ. ad grat. acidior. ſapor. Exhibe cochlearia duo vel tria ſingulis horis vel bihoris, vel ſæpius pro re nata.

By the uſe of this medicine, and ſoft light nouriſhment taken in ſmall quantities, the pulſe is uſually kept up

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up and the distemper goes off. But if, after taking this a little while, we find that the pulse does not rise, but on the contrary that a coldness of the extreme parts comes on, the medicines must be made more warming, by increasing the quantity of the snake-root and saffron, or by adding *vinum croceum*, *confectio cardiaca*, or the like, but not by the use of volatile spirits and salts, which hurt by their stimulating and dissolving qualities. Blisters our author reprobates in the strongest terms, and affirms that he has seen the place where a blister was applied turned perfectly black and sphacelated; so that if the spine and end of the ribs had not hindered, a large square passage would have been opened into the cavity of the thorax, had the patient lived a few hours after it.

At the same time that the strength of the patient is kept up by the medicines above-mentioned, or by others similar, he gave repeated gentle purgatives every second or third day, and sometimes, when the symptoms were very urgent, every day, for four or five days successively. But if proper methods be taken in the beginning of the disease, it is seldom that such a repetition of purging is necessary; and the Doctor gives the following remarkable instance of the efficacy of this method of treating the disease: "A young man about 24 years of age, surgeon to a Guinea ship, was brought into a house where I was visiting a patient; he was of a sanguine robust constitution, and a lover of spirituous liquors, and had been drunk three days and nights successively, and in that condition had run several races on the hot sea-shore, near noon, with the sailors, in the heat of the sun; and to complete his folly, lay the last night, after that exercise, in the open air under a tamarind-tree all the night, where he was seized in the morning with all the symptoms of this fever, in the most violent manner that I have ever seen any one. In this condition he was brought to the house where I was: his retching and vomiting were so incessant, that he could not get time to say yes, or no, to the questions which I asked, without waiting some time for it, each time; his eyes were red and inflamed, attended with a burning heat, as usual in the beginning of this fever; and he had all the other symptoms which attend the first attack of this fever in the most violent manner, which I need not repeat. I ordered ℥xvi. of blood to be taken from him, which was very florid, thin, and much dissolved; and then directed him to drink warm water freely, and to vomit eight or ten times; and after that to take *extract. Thebaic.* gr. jss. and take nothing for two hours after it. But I being gone, and he finding that he vomited with more ease, less sickness and retching, with the warm water, than he did before, and being much alarmed at his having this fever, he drank three gallons of the water, and brought up great quantities of yellow and blackish bilious matter with it, and washed his stomach effectually. He then took the *extr. thebaic.* and slept three or four hours after it; and the vomiting ceased: he took some panada, and four hours after that the purge of manna and tamarinds, &c. which gave him eight stools, and carried a good deal more of the putrid bilious matter off downwards; and got some rest after it: he then took of an antiseptic julep often, and light nourishment, a little acid, at the intervals; and repeated the purge on the third day, as directed. Being called out of the town, I did not see him till the fourth morning after; he said that he had followed my directions; and I found him free from the fever and all its symptoms, but weak and low, and his skin a little yellow, but much less so than usual, unless when the bilious matter is thus carried off. I ordered him to take *elix. vitrioli acid. gut.* lx. three or four times a-day for a few days, in an infusion of mint-leaves with a little snake-root, made as tea; which he did, and soon recovered perfectly well in seven or eight days time.

"This patient being seized in so violent a manner, and recovering in so short a time, and so near to the rule which the elegant Celsus recommends, *Citò, tutò, et jucundè*, not only confirmed the above manner of reasoning on the cause and nature of this disease to be right, but made me determine to follow the same method as near as I possibly could ever since, and I must add, with the same good success also, when I am called so early in the disease that I can strictly pursue it: which is too seldom the case; for in general the physician is not called till the fourth or fifth day, or after, when the putrid acrid bilious matter is a great part of it carried into the blood, which it has so dissolved and brought its whole mass into a colliquated, putrid, gangrenescent state, that the best of methods, and the most efficacious medicines, however judiciously timed and applied, are precarious and uncertain; or sometimes it is so far advanced, that the ablest physician can do no more than tell the relations of the sick that it is too late, and that they can live but a few hours: for I know no disease in which the recovery of the patient so much depends upon the right or wrong method of treating it, at the very first attack or beginning of the disease, as this fever does: for by thus discharging and carrying the putrid, acrimonious, bilious matter, out of the body before much of it is carried into the blood, not only most of the bad symptoms which attend the second state of the fever are prevented from coming on, but the hæmorrhagies, and the yellowness of the skin, &c. also, and the fever soon taken off too; for I have never seen any hæmorrhagy come on, and but little yellowness, or in some none, when they were thus treated.

"And when the last stage of this fever is come on before we are called in, provided that it is not at the very latter end of it, I have always found that this method of gentle purging, whenever the before-mentioned symptoms indicate it, and a liberal use of the antiseptic medicines in the intervals, has been so successful, that I have seen but two patients that have died in this fever during the eight years past in which I treated it in this manner; and one of them was so weak that he could not take a spoonful of any thing, and so near his end that he died about two hours after without taking any medicine; and the other killed himself by drinking a gallon of cold water in less than three hours time (after taking half an ounce of manna in the morning), which struck such a coldness into his whole body that he died; though I have visited several every year, and in some years a great many: therefore I take the liberty of recommending this method to others, and wish it to be as successful to all."

To the genus of *typhus* also belong all those fevers attended with very profuse and debilitating sweats, and which

Febres which have sometimes, not without good reason, been accounted plagues; such as the English sweating sickness, Miliaris sudatoria, *Sauv.* sp. 5. Ephemera sudatoria, *Sauv.* sp. 7. Ephemera Britannica, *Caius de ephem. Britan.*

169 GENUS VI. SYNOCHUS.

Synochus *Sauv.* gen. 81. *Lin.* 13.
Lenta *Lin.* 14.
Phrenitis *Vog.* 18.
Febris continua putrida *Boerh.* 730.

THIS is a contagious distemper, being a complication of a synocha and typhus; for the description and cure of which, we must of consequence refer to what hath been already said concerning these diseases.

The *Hectic* FEVER.

170 Hectica, *Sauv.* gen. 83. *Lin.* 24. *Vog.* 80. *Sag.* 684.

THIS disease is reckoned by Dr Cullen to be merely symptomatic; as indeed seems very probable, since it very generally accompanies absorptions of pus into the blood from internal suppurations, or indeed from such as are external, provided they be very large or of a bad kind.

Description. The best, indeed the only proper, description of this disorder we have is that by Dr Heberden. According to him, the appearance of the hectic fever is not unlike that of the genuine intermittent; from which, however, the disease is very different in its nature, while at the same time it is much more dangerous. In the true intermittent, the three stages of cold, heat, and sweat, are far more distinctly marked, the whole fit is much longer, the period which it observes is more constant and regular, and the intermissions are more perfect, than in the hectic fever. For in the latter, even in the clearest remission, there is usually a feverish quickness perceptible in the pulse, which seldom fails to exceed the utmost limit of a healthy one by at least 10 strokes in a minute.

The chillness of the hectic fever is sometimes succeeded by heat, and sometimes immediately by a sweat without any intermediate state of heat. The heat will sometimes come on without any remarkable chillness preceding; and the chillness has been observed to go off without being followed either by heat or sweat. The duration of these stages is seldom the same for three fits together; and as it is not uncommon for one of them to be wanting, the length of the whole fit must vary much more than in the true intermittent; but in general it is much shorter.

A patient subjected to hectic fever is little or nothing relieved by the coming on of the sweat; but is often as anxious and restless under it as during the chillness or heat. When the sweat is over, the fever will sometimes continue; and in the middle of the fever the chillness will return; which is a most certain mark of this disease.

The hectic fever will return with great exactness, like an intermittent, for two or perhaps three fits; but Dr Heberden informs us, that he does not remember ever to have known it keep the same period for four fits successively. The paroxysm will now and then keep off for 10 or 12 days; and at other times, especially when the patient is very ill, it will return so frequently on the same day, that the chillness of a new fit will follow immediately the sweat of the former. It is not unusual to have many threatenings of a shivering in the same day; and some degree of drowsiness is apt to attend the cessation of a fit. Hectica.

The urine in a true intermittent is clear in the fits and turbid in the intervals; but in the hectic fever it is liable to all kinds of irregularity. It will be equally clear or turbid in both stages; or turbid in the fits and clear in the intervals; and sometimes it will be, as in a true intermittent, clear during the fever, and thick at the going off.

Hectic patients often complain of pains like those of the rheumatism, which either affect by turns almost every part of the body, or else return constantly to the same part; which is often at a great distance from the seat of the principal disorder, and, as far as is known, without any peculiar connection with it. Those pains are so violent in some patients, as to require a large quantity of opium. As far as Dr Heberden has observed, they are most common, where the hectic arises from some ulcer open to the external air, as in cancers of the face, breast, &c. Joined with this fever, and arising probably from one common cause, he has been surprised to see swellings of the limbs, neck, or trunk of the body, rise up almost in an instant, as if the part was all at once grown fatter. These swellings are not painful, hard, or discoloured, and they continue for several hours.

Dr Heberden has seen this fever attack those who seemed in tolerable health, in a sudden and violent manner, like a common inflammatory one; and like that, also, in a very short time bring them into imminent danger of their lives; after which it has begun to abate, and to afford hopes of a perfect recovery. But though the danger might be over for the present, and but little of a fever remain; yet that little has soon demonstrated, that it was kept up by some great mischief within, and, proving unconquerable by any remedies, has gradually undermined the health of the patient, and never ceased except with his life. This manner of its beginning, however, is extraordinary. It much oftener dissembles its strength at first; and creeps on so slowly, that the subjects of it, though they be not perfectly well, yet for some months hardly think themselves ill; complaining only of being sooner tired with exercise than usual, of want of appetite, and of falling away. But gentle as the symptoms may seem, if the pulse be quicker than ordinary, so as to have the artery to beat 90 times and perhaps 120 times in a minute, there is the greatest reason to be apprehensive of the event. In no disorder, perhaps, is the pulse of more use to guide our judgment than in the hectic fever: yet even here we must be upon our guard, and not trust entirely to this criterion; for one in about 20 patients, with all the worst signs of decay from some incurable cause, which irresistibly goes on to destroy his life, will show not the smallest degree of quickness, nor any other irregularity of the pulse, to the day of his death.

Causes, &c. This fever will supervene whenever there is a great collection of matter formed in any part of the body; but it more particularly attends upon the inflam-

Febres Hectica.

inflammation of a scirrhous gland, and even upon one that is slight and only just beginning; the fever growing worse in proportion as the gland becomes more inflamed, ulcered, or gangrenous. And such is the lingering nature of those glandular disorders, that the first of those stages will continue for many months, and the second for some years.

If this scirrhous inflammation be external, or in the lungs, or some of the abdominal viscera, where the disturbance of their functions plainly points out the seat of the disorder, no doubt can be entertained concerning the cause of the fever. But if the part affected be not obvious to the senses, and its precise functions be not known, the hectic, which is there only part of the train of another disease, may be mistaken for the primary or only one.

Lying-in women, on account of the violence sustained in delivery, generally die when affected with this fever. Women of the age of near 50 and upwards are particularly liable to it. For, upon the cessation of their natural discharge, the glands of the breasts, ovaries, or womb, too commonly begin to grow scirrhous, and proceed to be cancerous. Not only these, but the glandular parts of all the abdominal viscera, are disposed to be affected at this particular time, and to become the seats of incurable disorders.

The injuries done to the stomach and liver by hard drinking are attended with similar symptoms, and terminate in the same manner.

Dr Heberden observes, that the slightest wound by a fine pointed instrument is known upon some occasions to bring on the greatest disturbances, and the most alarming symptoms, nay even death itself. For not only the wounded part will swell and be painful, but by turns almost every part of the body; and very distant parts have been known to come even to suppuration. These symptoms are constantly accompanied with this irregular intermittent, which lasts as long as any of them remain.

Prognosis. This anomalous fever is never less dangerous than when it belongs to a kindly suppuration, into which all the diseased parts are melted down, and for which there is a proper outlet.

The symptoms and danger from some small punctures, with their concomitant fever, most frequently give way in a few days; though in some persons they have continued for two or three months, and in others have proved fatal.

The inflammation of internal scirrhous glands, or of those in the breasts sometimes goes off, and the fever, which depended upon it, ceases; but it much oftener happens, that it proceeds to cancerous and gangrenous ulcers, and terminates only in death. Death is also, almost universally, the consequence of hectic fever from tubercles of the lungs, which have in general at least been considered as glandular bodies in a scirrhous state.

Cure. It is not to be expected that the same remedies will in every case be adapted to a fever which, arising from very different causes, is attended with such a variety of symptoms. A mixture of asafetida and opium has in some persons seemed singularly serviceable in this fever, when brought on by a small wound; but in most other cases the principal if not the sole attention of the physician must be employed in relieving the symptoms, by tempering the heat, by preventing both costiveness and purging, by procuring sleep, and by checking the sweats. If, at the same time, continues Dr Heberden, he put the body into as good general health as may be, by air, exercise, and a proper course of mild diet, he can perhaps do nothing better than to leave all the rest to nature. In some few fortunate patients, nature appears to have such resources, as may afford reason for entertaining hopes of cure, even in very bad cases. For some have recovered from this fever attended with every symptom of an abdominal viscus incurably diseased, after all probable methods of relief from art had been tried in vain, and after the flesh and strength were so exhausted as to leave scarce any hopes from nature. In those deplorable circumstances, there has arisen a swelling not far from the probable seat of the disorder, and yet without any discoverable communication with it. This swelling has come to an abscess; in consequence of which the pulse has soon returned to its natural state, as have also the appetite, flesh, and strength. What nature has performed in those rare cases, Dr Heberden acquaints us, he has often endeavoured to imitate, by making issues or applying blisters near the seat of the disease; but he cannot say with the same success.

It seems at present, Dr Heberden observes, the opinion of many practitioners, that the gangrenes will be stopped, and suppuration become more kindly, by the use of Peruvian bark; and therefore this remedy is always either advised or permitted in the irregular fever joined with suppurations and gangrenes. But he affirms he does not remember ever to have seen any good effect from the bark in this fever unattended with an apparent ulcer; and even in gangrenes it so often fails, that in successful cases, where it has been administered, there must be room for suspicion that the success was owing to another cause. Dr Heberden acknowledges at the same time, that he never saw any harm from the bark, in these, or indeed in any other cases, except a slight temporary purging or sickness, where it has happened to disagree with the stomach, or where the latter has been loaded by taking the medicine too fast, especially in dry boluses wrapped in wafer-paper.

In hectic illnesses, where all other means have proved ineffectual, a journey to Bath is usually proposed by the friends, and wished for by the sick; but Dr Heberden justly observes, that, besides the fatigue and many inconveniences of a journey to a dying person, the Bath waters are peculiarly hurtful in this fever, which they never fail to increase, and thereby aggravate the sufferings and hasten the death of the patient.

ORDER II. PHLEGMASIÆ. 171

Phlegmasiæ membranosæ et parenchymatosæ, *Sauv.* Class III. Ord. I. II. *Sag.* 605.
Morbi febriles phlogistici, *Lin.* Class III.
Febres continuæ compositæ inflammatoriæ, V.
Morbi acuti febriles, *Boerh.* 770.
Febres inflammatoriæ, *Hoffm.* II. 105. *Junck.* 61.

The phlegmasiæ, or topical inflammations, are a very numerous assemblage of diseases. Their great

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Phlegmasiæ. characteristics are, the general symptoms of fever, and a topical inflammation, attended with the lesion of some important function. And in most instances, when blood is drawn, it is found upon coagulation to be covered with a buffy coat. Under this order, many important genera are comprehended, each requiring a separate consideration.

172 GENUS VII. PHLOGOSIS.

173 Sp. I. PHLOGOSIS PHLEGMONE.

Phlegmone auctorum, *Sauv.* gen. 15. *Lin.* 39. *Vog.* 351.
Inflammatio, *Lin.* 231. *Boerh.* 370. *Junck.* 20.

This disease is a synocha fever, accompanied with an inflammation of some particular part either external or internal, and consequently it varies very much in its form and the degree of danger attending it, according to the situation and functions of the part affected with topical inflammation. To this species, therefore, belong the following diseases.

Furunculus, *Sauv.* gen. 18. *Vog.* 352.
Terminthus, *Vog.* 381.
Pupula, *Lin.* 275. *Sauv.* p. 6.
Varus, *Vog.* 436. *Lin.* 269. *Sauv.* p. 7.
Bacchia, *Lin.* 270.
Gutta Rosea, *Sauv.* gen. 4.
Gutta rosacea, *Vog.* 437.
Hordeolum, *Sauv.* gen. 27. *Lin.* 276. *Vog.* 434.
Otalgia, *Sauv.* gen. 197. *Lin.* 44. *Vog.* 148.
Dolor otalgicus, *Hoffm.* II. 336.
Parulis, *Vog.* 362.
Mastodynia, *Sauv.* gen. 210. *Vog* 153.
Paronychia, *Sauv.* gen. 21. *Lin.* 258 *Vog.* 345.
Arthrocace, *Sauv.* gen. 78. *Lin.* 256.
Pædarthrocace, *Vog* 419.
Spina ventosa, *Boerh.* 526.
Phimosis, *Sauv.* gen. 22. *Lin.* 297. *Vog.* 348.
Paraphimosis, *Vog.* 349.

For the cure of inflammations, Dr Cullen lays down the following indications. 1. To remove the remote causes when they are evident and continue to operate. 2. To take off the phlogistic diathesis affecting the whole system, or the particular part. 3. To take off the spasm of the particular part by remedies applied to the whole system or to the part itself.

The means of removing the remote causes will readily occur, from considering the particular nature and circumstances of the different kinds. Acrid matters must be removed, or their action must be prevented, by the application of demulcents. Compressing and overstretching powers must be taken away; and from their several circumstances, the means of doing so will be obvious.

The means of taking off the phlogistic diathesis of the system are the same with those already mentioned under the cure for synocha. The means of taking off the spasm also from the particular part, are much the same with those already mentioned. Only it is to be remembered, that topical bleedings, such as cupping with scarifications, applying leeches, &c. are in this case much more indicated; and that some of the other remedies are to be directed more particularly to the part affected, as shall be more fully considered when we treat of those diseases attended with particular inflammations.

When a tendency to suppuration is perceived, the proper indication is to promote the production of perfect pus as much as possible. For this purpose various remedies, supposed to possess a specific power, have been proposed: but it does not appear that any of them are possessed of a virtue of this kind; and, in Dr Cullen's opinion, all that can be done is to favour the suppuration by such applications as may support a moderate heat in the part, by some tenacity confine the perspiration, and by an emollient quality may weaken the cohesion of the teguments, and favour their erosion. As all abscesses are occasioned by the effusion of fluids, and as in the case of certain effusions a suppuration becomes not only unavoidable but desirable, it may be supposed that most of the means of procuring a resolution by diminishing the force of circulation, &c. ought to be avoided. But as we observe on the one hand, that a certain degree of increased impetus, or of the original symptoms of inflammation, is necessary to produce a proper suppuration; so it is then especially necessary to avoid those means of resolution which may diminish too much the force of circulation. And on the other hand, as the impetus of the blood, when violent, is found to prevent the proper suppuration; so, in such cases, though a tendency to suppuration may have begun, it may be proper to continue those means of resolution which moderate the force of the circulation. With respect to the opening of abscesses when completely formed, see the article SURGERY.

When an inflammation has taken a tendency to gangrene, that event is to be prevented by every possible means; and these must be different according to the nature of the several causes: but after a gangrene has in some degree taken place, it can be cured only by the separation of the dead from the living parts. This in certain circumstances can be performed, and most properly, by the knife. In other cases it can be done by exciting a suppuratory inflammation on the verge of the living part, whereby its cohesion with the dead part may be every where broken off, so that the latter may fall off by itself. While this is doing, it is proper to prevent the further putrefaction of the part, and its spreading wider. For this purpose various antiseptic applications have been proposed: but Dr Cullen is of opinion, that while the teguments are entire, these applications can hardly have any effect; and therefore, that the fundamental procedure must be to scarify the part so as to reach the living substance, and, by the wounds made there, to excite the suppuration required. By the same incisions also we give access to antiseptics, which may both prevent the progress of the putrefaction in the dead, and excite the inflammation necessary on the verge of the living parts

When the gangrene proceeds from the loss of tone, and when this communicated to the neighbouring parts prevents that inflammation which, as we have said, is requisite to the separation of the dead parts from the living, it will be necessary to obviate this loss of tone by tonic medicines given internally; and for this purpose the Peruvian bark has been found to be most effectual. But when the gangrene arises from the violence of inflammation, the bark may not only fail of proving a remedy, but may do harm: for its power as a tonic is especially suited to those cases of gangrene which proceed from an original loss of tone, as in the case

Phlogosis.

Phlegmasiæ

case of palsy and œdema; or in those cases where a loss of tone takes place while the original inflammatory symptoms are removed.

On the other hand, Mr Bell is of opinion, that incisions made with a view to admit the operation of antiseptic remedies in gangrenes, as well as the remedies themselves, must be pernicious from the irritation they occasion, and from the danger of wounding blood-vessels, nerves, or tendons, and also by allowing a free passage for the putrescent fluids into the parts not yet affected. And unless they be carried so deep as to reach the sound parts, applications of the antiseptic kind can never have any effect in answering the purpose for which they were intended. The same author also remarks, that all the advantages commonly observed from the great number of applications recommended for gangrene, are obtained with more ease, and generally too with more certainty, from the use of some gentle stimulating embrocation; which, by exciting a slight irritation upon the surface, especially when assisted by a free use of the Peruvian bark, produces for the most part such a degree of inflammation as is wished for. With this view he has frequently known a weak solution of sal ammoniac, a drachm of the salt to two ounces of vinegar and six of water, form a mixture of a very proper strength for every purpose of this kind. But the degree of stimulus can easily be either increased or diminished according to circumstances, by using a larger or smaller proportion of the salt.

Whenever, either by the means recommended, or by a natural exertion of the system, a slight inflammation appears between the diseased and sound parts, we may in general, with tolerable certainty, expect, that in due time the parts will be separated; and when a full suppuration is once fairly established, there can be little doubt that the mortified parts will be soon and easily removed.

A complete separation being effected, the remaining sore is to be treated in the manner described under the article SURGERY; with a proper attention, at the same time, to the support of the general system by the continuance of a nourishing diet, and the bark with such quantities of wine as may seem necessary.

With regard to the bark, however, it is proper to take notice of another case of mortification in which it is likewise unsuccessful, as well as in that attended with an high degree of inflammation; and that is, in those mortifications of the toes and feet, common in old people, or which arise from any cause increasing the rigidity of the vessels to such a degree as to prevent the motion of the fluids through them. In this case Mr Pott has discovered, that all kinds of warm applications are very unsuccessful; but that by the free use of opium, together with sedatives and relaxants externally applied, he has frequently seen the tumefaction of the feet and ancles subside, the skin recover its natural colour, and all the mortified parts separate in a very short time, leaving a clean sore. But as to scarifications, or any other attempt to separate artificially the mortified from the sound parts, he thinks them very prejudicial, by giving pain; which is generally of itself violent in this disease, and which seems to have a great share in producing the other evils.

The other terminations of inflammation either do not admit of any treatment except that of preventing them by resolution, or properly belong to the article SURGERY.

Phlogosis.

Sp. II. PHLOGOSIS ERYTHEMA. 174

Erythema, *Sauv.* gen. 11.
  Erysipelas auctorum, *Vog.* 343.
  Hieropyr. *Vog.* 344.
Anthrax, *Sauv.* gen. 19. *Lin.* 272. *Vog.* 353.
  Carbo et carbunculus auctorum.
  Erythema gangrænosum, *Sauv.* sp. 7.
Erythema a frigore.
  Erythema pernio, *Sauv.* sp. 4
  Pernio, *Lin.* 259. *Vog.* 350.
Erythema ambustio, *Sauv.* sp. 2.
  Erysipelas ambustio, *Sauv.* sp. 4.
  Combustura, *Lin.* 245.
  Combustio, *Boerh.* 476.
  Encausis, *Vog.* 347.
Erythema ab acri alieno applicato.
  Erysipelas Chinense, *Sauv.* sp. 7.
Erythema ab acri inquilino.
  Erythema intertrigo, *Sauv.* sp. 5.
  Intertrigo, *Lin.* 247. *Vog.* 502.
Erythema a compressione.
  Erythema paratrima, *Sauv.* sp. 6.
Erythema a punctura, *Sauv.* sp. 9.
  Erysipelas a vespis, *Sauv.* sp. 19.
  Psydracia a vespis, *Sauv.* sp. 2.
Erythema cum phlegmone.
  Erysipelas phlegmonodes auctorum.
Erythema cum œdemate.
  Erysipelas symptomaticum, *Sauv.* sp. 6.

The word *erythema* doth not apply to any primary disease, but to a great number of those cutaneous inflammations denominated by another general term, *viz.* the *erysipelas*, or "St Anthony's fire;" and which being commonly symptomatic, of some other inflammation or disorder, are to be removed only by removing the primary disease: the erythema is found scarcely to bear any kind of warm application to itself; and is very apt, if treated as a primary disease, to terminate in a gangrene of the part affected, or some other disorder still more dangerous. The difference between the *phlegmon* or preceding species, and *erythema*, according to Dr Cullen, is, that, in the former, the inflammation seems particularly to affect the vessels on the internal surface of the skin, communicating with the lax adjacent cellular texture; whence a more copious effusion, and that too of serum convertible into pus, takes place. In the erythema the affection is of the vessels on the external surface of the skin communicating with the *rete mucosum*, which does not admit of any effusion but what separates the cuticle and gives occasion to the formation of a blister, while the smaller size of the vessels admits only of the effusion of a thin fluid very seldom convertible into pus. For the cure of the fever attended with erythema or *erysipelas*, see below; and for the external treatment of erythema, see the article SURGERY.

GENUS VIII. OPHTHALMIA. 175
Inflammation of the Eyes.

Ophthalmia, *Sauv.* gen. 196. *Lin.* 43. *Vog.* 341. *Sag.* 231. *Junck.* 24.
Chemosis, *Vog.* 46.

Ophthalmites, *Vog.* 47.
Inflammatio oculorum, *Hoffm.* II. 165.
Ophthalmia taraxis, *Sauv.* ſp. 1.
Ophthalmia humida, *Sauv.* ſp. 8.
Ophthalmia chemoſis, *Sauv.* ſp. 12.
Ophthalmia eryſipelatoſa, *Sauv.* ſp. 7.
Ophthalmia puſtuloſa, *Sauv.* ſp. 6.
Ophthalmia phlyctænodes, *Sauv.* ſp. 21.
Ophthalmia choroeidea, *Sauv.* ſp. 13.
Ophthalmia tenebricoſa, *Sauv.* ſp. 10.
Ophthalmia trachoma, *Sauv.* ſp. 4.
Ophthalmia ſicca, *Sauv.* ſp. 5.
Ophthalmia angularis, *Sauv.* ſp. 14.
Ophthalmia tuberculoſa, *Sauv* ſp. 3.
Ophthalmia trichiaſis, *Sauv.* ſp 2.
Ophthalmia cancroſa, *Sauv.* ſp. 15.
Ophthalmia a ſynechia, *Sauv.* ſp. 16.
Ophthalmia a lagophthalmo, *Sauv.* ſp. 17.
Ophthalmia ab elcomate, *Sauv.* ſp 18.
Ophthalmia ab ungue, *Sauv.* ſp. 19.
Ophthalmia a corneæ fiſtula, *Sauv.* ſp. 20.
Ophthalmia uveæ, *Sauv.* ſp. 22.
Ophthalmia metaſtatica, *Sauv.* ſp. 24.
Ophthalmia ſcrophuloſa, *Sauv.* ſp. 9.
Ophthalmia ſyphilitica, *Sauv.* ſp. 11.
Ophthalmia febricoſa, *Sauv.* ſp. 23.

From reading this long liſt of diſtinctions which authors have invented in the ophthalmia, it is evident, that by far the greateſt part of them are ſymptomatic, or merely the conſequences of other diſorders preſent in the habit; and therefore the remedies muſt be directed towards the removal of theſe primary diſorders; and when they are gone the opthalmia will be removed of courſe. Dr Cullen obſerves, that the inflammation of the eye may be conſidered as of two kinds; according as it is ſeated in the membranes of the ball of the eye, when it is named *ophthalmia membranarum*; or as it is ſeated in the ſebaceous glands placed in the tarſus, or edges of the eye-lids, in which caſe it may be termed *ophthalmia tarſi*. Theſe two kinds are very frequently connected together, as the one may excite the other; but they are ſtill to be diſtinguiſhed according as the one or the other may happen to be the primary affection.

1. The inflammation of the *membranes* of the eye affects eſpecially, and moſt frequently, the adnata, and appears in a turgeſcence of its veſſels; ſo that the red veſſels which are naturally there, become not only increaſed in ſize, but many more appear than in a natural ſtate. This turgeſcence of the veſſels is attended with pain, eſpecially upon the motion of the ball of the eye; and this irritation, like every other, applied to the ſurface of the eye, produces an effuſion of tears from the lacrymal gland.

The inflammation commonly, and chiefly, affects the adnata ſpread on the anterior part of the bulb of the eye; but uſually ſpreads alſo along the continuation of the adnata on the inſide of the palpebræ; and as that is extended on the tarſus palpebrarum, the excretories of the ſebaceous glands opening there are alſo frequently affected. When the affection of the adnata is conſiderable, it may be communicated to the ſubjacent membranes of the eye, and even to the retina itſelf; which thereby acquires ſo great ſenſibility, that every impreſſion of light becomes painful. The inflammation of the membranes of the eye is in different degrees, according as the adnata is more or leſs affected, or according as the inflammation is either of the adnata alone, or of the ſubjacent membranes alſo; and upon theſe differences, different ſpecies have been eſtabliſhed; but they ſeem all to differ only in degree, and are to be cured by the ſame remedies more or leſs employed.

The proximate cauſe of ophthalmia is not different from that of inflammation in general; and the different circumſtances of ophthalmia may be explained by the difference of its remote cauſes, and by the different parts of the eye which it happens to affect; as may be underſtood from what has been already ſaid. We ſhall therefore proceed to give an account of the method of cure.

The great objects to be aimed at in the treatment of ophthalmia, are, in the firſt place, the reſolution of the inflammation which has already taken place; and, ſecondly, the removal of thoſe conſequences which frequently ariſe from the inflammation, eſpecially if it have been of long ſtanding. But beſides theſe, while it has appeared from former obſervation, that there is a peculiar diſpoſition to the diſeaſe, practices may often be ſucceſsfully employed to combat this diſpoſition, and thus prevent the return of the affection.

The ophthalmia membranarum requires the remedies proper for inflammation in general; and when the deeper-ſeated membranes are affected, and eſpecially when a pyrexia is preſent, large general bleedings may be neceſſary. But this laſt is ſeldom the caſe; and, for the moſt part, the ophthalmia is an affection merely local, accompanied with little or no pyrexia. General bleedings therefore have little effect upon it, and the cure is chiefly to be obtained by topical bleedings, that is, blood drawn from the veſſels near the inflamed part; and opening the jugular vein, or the temporal artery, may be conſidered as in ſome meaſure of this kind. It is commonly ſufficient to apply a number of leeches round the eye; but it is perhaps ſtill better to draw blood by cupping and ſcarifying upon the temples. In many caſes, the moſt effectual remedy is to ſcarify the internal ſurface of the inferior eye-lid, and to cut the turgid veſſels upon the adnata itſelf.

Beſides blood-letting, purging, as a remedy ſuited to inflammation in general, has been conſidered as peculiarly adapted to inflammation in any part of the head, and therefore to ophthalmia; and it is ſometimes uſeful: but, for the reaſons given before with reſpect to general bleeding, purging in the caſe of ophthalmia does not prove uſeful in any proportion to the evacuation excited.—For relaxing the ſpaſm in the part, and taking off the determination of the fluids to it, bliſtering near the part has commonly been found uſeful. When the inflammation does not yield to the application of bliſters after topical bleeding, great benefit is often obtained by ſupporting a diſcharge from the bliſtered part, under the form of an iſſue, by which means a more permanent determination of blood from the part is obtained.

It is probably alſo on the ſame principle that the good effects obtained from the uſe of errhine medicines in obſtinate caſes of ophthalmia are to be accounted for. By theſe errhines, in particular, which occaſion

Phlegmasiæ and support for some time a great discharge from the nose, great benefit has often been obtained. The powder of asarabacca, or the infusion of hippocastanum, snuffed up the nose at bed-time in proper doses, are often productive of the best effects, when many other remedies have been tried in vain.

Ophthalmia, as an external inflammation, admits of topical applications. All those, however, which increase the heat and relax the vessels of the part, prove hurtful; and the admission of cool air to the eye, and the application of cooling and astringent medicines, which at the same time do not produce irritation, prove useful. Of all these the solution of acetated lead, assiduously applied, is perhaps the best. In the cure of this distemper, indeed, all irritation must carefully be avoided, particularly that of light; and the only certain means of doing this is by keeping the patient in a very dark chamber.

2. In the *ophthalmia tarsi*, the same medicines may be necessary, as have been already recommended, for the ophthalmia membranarum. However, as the ophthalmia tarsi may often depend upon an acrimony deposited in the sebaceous glands of the part, so it may require various internal remedies according to the variety of the acrimony in fault; for which we must refer to the consideration of scrophula, syphilis, or other diseases with which this ophthalmia may be connected; and where these shall not be evident, certain remedies more generally adapted to the evacuation of acrimony, such as mercury, may be employed. In the ophthalmia tarsi, it almost constantly happens that some ulcerations are formed on the tarsus. These require the application of mercury and copper, which alone may sometimes cure the whole affection; and they may be useful even when the disease depends upon a fault of the whole system.

Both in the ophthalmia membranarum, and in the ophthalmia tarsi, it is necessary to obviate that glueing together of the eye-lids which commonly happens in sleep; and which may be done by insinuating a little of any mild unctuous medicine between the eye-lids before the patient shall go to sleep.

The slighter kinds of inflammations from the dust or the sun, may be removed by fomenting with warm milk and water, adding a small portion of brandy; and by anointing the borders of the eye-lids with *unguentum tutiæ*, or the like, at night, especially when those parts are excoriated and sore. But in bad cases, after the inflammation has yielded a little to evacuations, the *cataplasma aluminis* of the London pharmacopœia spread on lint, and applied at bed-time, has been found the best external remedy. Before the use of the latter, the solution of white vitriol is prescribed with advantage; and in violent pains it is of service to foment frequently with a decoction of white poppy-heads. One of the most common and most disagreeable consequences of ophthalmia, is an offuscation of the cornea, so far obstructing the passage of light as to diminish or prevent vision. This is sometimes so considerable as to admit of removal by operation: but in slighter cases it may often be removed by the application of different gentle escharotics; and in this way, without the least danger of any inconvenience, good effects are often obtained, from gently introducing into the eye at bed-time a powder consisting of equal parts of crystals of tartar and sugar. Ophthalmia.

Where there is a disposition to frequent returns of this affection, the Peruvian bark is often employed with success in combating it: But nothing in general answers better than frequent and regular cold bathing of the eyes.

Genus IX. PHRENITIS. 176

Phrenzy, or *Inflammation of the Brain*.

Phrenitis, *Sauv.* gen. 101. *Lin.* 25. *Sag.* gen. 301. *Boerh.* 771. *Hoffm.* II. 131. *Junck.* 63.
Phrenismus. *Vog.* 45.
Cephalitis, *Sauv.* gen. 109. *Sag.* gen. 310.
Sphacelismus, *Lin.* 32.
Phrenitis vera, *Sauv.* sp. 1. *Boerh.* 771.
Phrenitis idiopathica, *Junck.* 63.
Cephalalgia inflammatoria, *Sauv.* sp. 9.
Cephalitis spontanea, *Sauv.* sp. 3.
Cephalitis siriasis, *Sauv.* sp. 4.
Siriasis, *Vog.* 34.
Cephalitis Littriana, *Sauv.* sp. 5.

Dr Cullen observes, that the true phrenitis, or inflammation of the membranes or substance of the brain, is very rare as an original disease: but, as a symptom of others, much more frequent; of which the following kinds are enumerated by different authors.

Phrenitis synochi pleuriticæ, *Sauv.* sp. 2.
Phrenitis synochi sanguineæ, *Sauv* sp. 4.
Phrenitis calentura, *Sauv.* sp 11.
Phrenitis Indica, *Sauv* sp. 12
Cephalitis Ægyptiaca, *Sauv.* sp. 1.
Cephalitis epidemica anno 1510, *Sauv.* sp. 6.
Cephalitis verminosa, *Sauv.* sp. 7.
Cephalitis cerebelli, *Sauv.* sp. 8.
Phrenitis miliaris, *Sauv.* sp. 3.
Phrenitis variolosa, *Sauv* sp 5.
Phrenitis morbillosa, *Sauv.* sp. 6.
Phrenitis a plica, *Sauv.* sp. 8.
Phrenitis aphrodisiaca, *Sauv.* sp. 9.
Phrenitis a tarantismo, *Suav* sp 14.
Phrenitis hydrophobica, *Sauv.* sp. 15.
Phrenitis a dolore, *Sauv.* sp. 13
Cephalitis traumatica, *Sauv.* sp. 2.

Description. The signs of an impending phrenitis are, immoderate and continual watchings; or if any sleep be obtained, it is disturbed with dreams and gives no refreshment; acute and lasting pains, especially in the hind part of the head and neck; little thirst; a great and slow respiration, as if proceeding from the bottom of the breast, the pulse sometimes small and slow, sometimes quick and frequent; a suppression of urine; and forgetfulness. The distemper when present may be known by the following signs: The veins of the head swell, and the temporal arteries throb much; the eyes are fixed, sparkle, and have a fierce aspect; the speech is incoherent, and the patient behaves very roughly to the by-standers, with furious attempts to get out of bed, not indeed continually, but returning as it were by paroxysms; the tongue is dry, rough, yellow, or black; there is a coldness of the external parts; a proneness to anger; chattering of the teeth; a trembling of the hands, with

Tegma fix with which the ſick ſeem to be gathering ſomething, and actually do gather the naps off the bed-clothes.

Cauſes of, and perſons ſubject to, this diſorder. People of a hot and bilious habit of body, and ſuch as are of a paſſionate diſpoſition, are apt to be affected with phrenitis. In the ſame danger are thoſe who uſe much ſpices, or are given to hot and ſpirituous liquors; who have been expoſed more than uſual to the ſun, or obliged to undergo immoderate ſtudies or watchings; who are ſubject to head-achs, or in whom ſome cuſtomary hemorrhages have been ſtopped; or the diſeaſe may ariſe from ſome injury offered to the head externally. Dr Pringle obſerves, that the phrenitis, when conſidered as an original diſeaſe, is apt to attack ſoldiers in the ſummer-ſeaſon when they are expoſed to the heat of the ſun, and eſpecially when aſleep and in liquor. A ſymptomatic phrenitis is alſo more frequent in the army than elſewhere, on account of the violence done to all fevers when the ſick are carried in waggons from the camp to an hoſpital, where the very noiſe or light alone would be ſufficient, with more delicate natures, to raiſe a phrenzy. From theſe and ſimilar cauſes, a ſtate of active inflammation, affecting ſome parts within the cranium, is produced: and there can be no doubt, that from this all the ſymptoms of the diſeaſe ariſe, and particularly that peculiar delirium which characteriſes it. But in what manner local diſeaſes, even of the brain itſelf, produce affections of the mind, we are ſtill totally in the dark.

Prognoſis. Every kind of phrenitis, whether idiopathic or ſymptomatic, is attended with a high degree of danger; and, unleſs removed before the fourth day, a gangrene or ſphacelus of the meninges readily takes place, and the patient dies delirious. The following are the moſt fatal ſymptoms: A continual and furious delirium, with watching; thin watery urine, white fæces, the urine and ſtools running off involuntarily, or a total ſuppreſſion of theſe excretions; a ready diſpoſition to become ſtupid, or to faint; trembling, rigor, chattering of the teeth, convulſions, hiccough, coldneſs of the extremities, trembling of the tongue, ſhrill voice, a ſudden ceſſation of pain, with apparent tranquillity. The following are favourable: Sweats, apparently critical, breaking out; a ſeeming effort of nature to terminate the diſeaſe by a diarrhœa; a large hemorrhagy from the noſe; ſwellings of the glands behind the ears; hæmorrhoids.

Cure. From what has been ſaid of the theory of this diſeaſe, the cure muſt entirely depend on obtaining a reſolution of the inflammation. The objects chiefly to be aimed at with this view are, 1. The removal of ſuch exciting cauſes as continue to operate. 2. The diminution of the momentum of the blood in the circulating ſyſtem in general. 3. The diminution of impetus at the brain in particular: and, 4. The avoiding circumſtances which tend either to accelerate the motion of the blood or to give determination to the head.

Different practices may be uſed with theſe intentions; but here the moſt powerful remedies are to be immediately employed. Large and repeated bleedings are eſpecially neceſſary, and theſe too taken from veſſels as near as poſſible to the part affected. The opening the temporal artery has been recommended, and with ſome reaſon: but as the practice is attended with ſome inconveniences, perhaps the opening of the jugular veins may prove more effectual; with which, however, may be joined the drawing of blood from the temples by cupping and ſcarifying. It is alſo probable, that purging may be of more uſe in this than in ſome other inflammatory affections, as it may operate by revulſion. For the ſame purpoſe of revulſion, warm pediluvia are a remedy, but rather ambiguous. The taking off the force of the blood in the veſſels of the head by an erect poſture is generally uſeful. Bliſtering is alſo uſeful, but chiefly when applied near to the part affected. In ſhort, every part of the antiphlogiſtic regimen is here neceſſary, and particularly the admiſſion of cold air. Even cold ſubſtances applied to the head have been found uſeful; and the application of ſuch refrigerants as vinegar is certainly proper. Opiates are thought to be hurtful in every inflammatory ſtate of the brain. On the whole, however, it muſt be remarked, that practitioners are very uncertain with regard to the means proper to be uſed in this diſeaſe; and the more ſo, that the ſymptoms by which the diſeaſe is commonly judged to be preſent, appear ſometimes without any internal inflammation; and on the other hand, diſſections have ſhown that the brain has been inflamed, where few of the peculiar ſymptoms of inflammation had appeared before. Phrenitis.

GENUS X. CYNANCHE. 177

Cynanche, *Sauv.* gen. 110. *Lin.* 33. *Sag* gen. 302.
Angina, *Vog.* 49. *Hoffm.* II. 125. *Junck.* 30.
Angina inflammatoria, *Boerh.* 798.

Sp. I. CYNANCHE TONSILLARIS. 178
The *Inflammatory Quinsy.*

Cynanche tonſillaris, *Sauv.* ſp. 1.
Anginæ inflammatoria, ſp. 5. *Boerh.* 805.

Deſcription. This is an inflammation of the mucous membrane of the fauces, affecting principally that congeries of mucous follicles which forms the tonſils; and from thence ſpreading along the velum and uvula, ſo as frequently to affect every part of the mucous membrane. The diſeaſe appears by ſome tumor and redneſs of the parts; is attended with a painful and difficult deglutition; a troubleſome clamminеſs of the mouth and throat; a frequent but difficult excretion of mucus; and the whole is accompanied with pyrexia. The inflammation and tumor are commonly at firſt moſt conſiderable in one tonſil; and afterwards, abating in that, increaſe in the other. This diſeaſe is not contagious.

Cauſes of, and perſons ſubject to, this diſorder. This diſeaſe is commonly occaſioned by cold externally applied, particularly about the neck. It affects eſpecially the young and ſanguine; and a diſpoſition to it is often acquired by habit. It occurs eſpecially in the ſpring and autumn, when viciſſitudes of heat and cold frequently take place.

Prognoſis. This ſpecies of quinſy terminates frequently by reſolution, ſometimes by ſuppuration, but hardly ever by gangrene; though in ſome caſes ſloughy ſpots appear on the fauces: the prognoſis therefore is generally favourable.

Cure. As the principal morbid affection in this diſeaſe, on which all its characteriſing ſymptoms immediately

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mediately depend, is the active inflammation in the tonsils and neighbouring parts, the object first and principally to be aimed at in the cure is to obtain a resolution of this inflammation. Sometimes, however, it is necessary to have recourse to practices, with the view of obviating urgent symptoms before a resolution can be effected: and in other cases, where a resolution cannot be obtained, it must be the aim of the practitioner to promote a speedy and favourable suppuration. After suppuration has taken place, the proper means of promoting a discharge of the purulent matter will conclude the cure. Here some bleeding may be necessary; but large and general evacuations are seldom beneficial. The opening of the ranular veins seems to be an insignificant remedy, according to Dr Cullen, but is recommended as efficacious by Sir John Pringle: more benefit, however, may in general be derived from leeches to the external fauces. The inflammation may be often relieved by moderate astringents, and particularly by acids applied to the parts affected. In many cases, nothing has been found to give more relief than the vapour of warm water received into the fauces.

Besides these, blistering, and still more frequently rubefacient medicines, are applied with success, as well as antiphlogistic purgatives; and every part of the antiphlogistic regimen is to be observed, except the application of cold. Sir John Pringle recommends a thick piece of flannel moistened with two parts of common sweet oil, and one of spirit of hartshorn (or in a larger proportion, if the skin will bear it), to be applied to the throat, and renewed once every four or five hours. By this means the neck, and sometimes the whole body, is put into a sweat, which after bleeding either carries off or lessens the inflammation. When the disease takes a tendency to suppuration, nothing will be more useful than the taking into the fauces the steams of warm water. Benefit is also obtained from poultices applied to the external fauces. When the abscess is attended with much swelling, if it break not spontaneously, it ought to be opened by a lancet; and this does not require much caution, as even the inflammatory state may be relieved by some scarification of the tonsils. When this disease runs very rapidly to such a height as to threaten suffocation, it is sometimes necessary to have recourse to bronchotomy as the only mean of saving the life of the patient. But there is reason to believe that this operation has sometimes been employed where it was not necessary: and we may safely venture to say, that it is but seldom requisite; insomuch that Dr Cullen tells us, he has never in his practice seen any case requiring bronchotomy.

179 Sp. II. CYNANCHE MALIGNA.

The *malignant*, *putrid*, or *ulcerous* SORE THROAT.

Cynanche maligna, *Sauv.* sp. 3.

Cynanche ulcerosa, *Sauv.* var. a. Journ. de Med. 1758.

Cynanche gangrænosa, *Sauv.* var. b. Journ. de Med. 1756.

Ulcera faucium et gutturis anginosa et lethalia, Hispanis *Garrotillo*, *Lud. Mercat.* consult. 24.

Angina ulcerosa, *Fothergill*'s Account of the ulcerous sore throat, edit. 1751. *Huxham* on the malignant ulcerous sore throat, from 1751 to 1753.

Cynanche.

Febris epidemica cum angina ulcusculosa, *Douglas*'s Practical History, Boston 1736.

Angina epidemica, *Russel*, Oecon. Natur. p. 105.

Angina gangrænosa, *Withering*'s Differt. Inaug. Edinb. 1766.

Angina suffocativa, *Bard*'s Inquiry, New-York, 1771.

Angina maligna, *Johnstone* on the malignant Angina, Worcester, 1779.

History and description. This distemper is not particularly described by the ancient physicians; though perhaps the Syrian and Egyptian ulcers mentioned by Aretæus Cappadox, and the pestilent ulcerated tonsils we read of in Aetius Amideus, were of this nature. Some of the scarlet fevers mentioned by Morton seem also to have approached near to it. In the beginning of the last century, a disease exactly similar to this is described by the physicians of that time, as raging with great violence and mortality in Spain and some parts of Italy; but no account of it was published in this country till the year 1748, when a very accurate one was drawn up by Dr Fothergill, and in 1752 by Dr Huxham. The latter observes, that this disease was preceded by long, cold, and wet seasons; by which probably the bodies of people were debilitated, and more apt to receive contagion, which possibly also might be produced by the stagnant and putrid waters.

The attack of this disease was very different in different persons. Sometimes a rigor, with fulness and soreness of the throat, and painful stiffness of the neck, were the first symptoms complained of. Sometimes alternate chills and heats, with some degree of giddiness, drowsiness, or head-ach, ushered in the distemper. It seized others with much more feverish symptoms; great pain of the head, back, and limbs; a vast oppression of the præcordia, and continual sighing. Some grown persons went about for some days in a drooping state, with much uneasiness and anxiety, till at last they were obliged to take to their beds.—Thus various was the disease, says Dr Huxham, at the onset. But it commonly began with chills and heats, load and pain of the head, soreness of throat, and hoarseness; some cough, sickness at stomach, frequent vomiting and purging, in children especially, which were sometimes very severe; though a contrary state was more common to the adult. There was in all a very great dejection of spirits, very sudden weakness, great heaviness on the breast, and faintness, from the very beginning. The pulse in general was quick, small, and fluttering, though sometimes heavy and undulating. The urine was commonly pale, thin, and crude; however, in many grown persons, it was passed in small quantities and high-coloured, or like turbid whey. The eyes were heavy, reddish, and as it were weeping; the countenance very often full, flushed, and bloated, though sometimes pale, and sunk.

How slight soever the disorder might appear in the day-time, at night the symptoms became greatly aggravated, and the feverish habit very much increased, nay, sometimes a delirium occurred on the very first night; and this exacerbation constantly returned thro' the whole course of the disease. Indeed, when it was considerably on the decline, our author says he has been often pretty much surprised to find his patient had

had paſſed the whole night in a phrenzy, whom he had left tolerably cool and ſedate in the day.

Some few hours after the ſeizure, and ſometimes cotemporary with it, a ſwelling and ſoreneſs of the throat was perceived, and the tonſils became very tumid and inflamed, and many times the parotid and maxillary glands ſwelled very much, and very ſuddenly, even at the very beginning; ſometimes ſo much as even to threaten ſtrangulation. The fauces alſo very ſoon appeared of a high florid red, or rather of a bright crimſon, colour, very ſhining and gloſſy; and moſt commonly on the uvula, tonſils, velum palatinum, and back part of the pharynx, ſeveral whitiſh or aſh-coloured ſpots appeared ſcattered up and down, which oftentimes increaſed very faſt, and ſoon covered one or both the tonſils, uvula, &c. thoſe in the event proved ſloughs of ſuperficial ulcers (which ſometimes, however, eat very deep into the parts). The tongue at this time, though only white and moiſt at the top, was very foul at the root, and covered with a thick yellowiſh or brown coat. The breath alſo now began to be very nauſeous; which offenſive ſmell increaſed hourly, and in ſome became at length intolerable, and that too ſometimes even to the patients themſelves.

The ſecond or third day every ſymptom became much more aggravated, and the fever much more conſiderable; and thoſe that had ſtruggled with it tolerably well for 30 or 40 hours, were forced to ſubmit. The reſtleſſneſs and anxiety greatly increaſed, as well as the difficulty in ſwallowing. The head was very giddy, pained, and loaded; there was generally more or leſs of a delirium; ſometimes a pervigilium and perpetual phrenzy, though others lay very ſtupid, but often ſtarting and muttering to themſelves. The ſkin was very hot, dry, and rough; there was very rarely any diſpoſition to ſweat. The urine was pale, thin, crude; often yellowiſh and turbid. Sometimes a vomiting was urgent, and ſometimes a very great looſeneſs, in children particularly. The ſloughs were now much enlarged, and of a darker colour, and the ſurrounding parts tended much more to a livid hue. The breathing became much more difficult; with a kind of a rattling ſtertor, as if the patient was actually ſtrangling, the voice being exceeding hoarſe and hollow, exactly reſembling that from venereal ulcers in the fauces: this noiſe in ſpeaking and breathing was ſo peculiar, that any perſon in the leaſt converſant with the diſeaſe might eaſily know it by this odd noiſe; from whence indeed the Spaniſh phyſicians gave it the name of *garotillo*, expreſſing the noiſe made by perſons when they are ſtrangled with a rope. Our author never obſerved in one of them the ſhrill barking noiſe that we frequently hear in inflammatory quinſies. The breath of all the diſeaſed was very nauſeous; of ſome inſufferably fetid, eſpecially in the advance of the diſtemper to a criſis; and many about the fourth or fifth day ſpit off a vaſt quantity of ſtinking purulent mucus tinged ſometimes with blood; and ſometimes the matter was quite livid, and of an abominable ſmell The noſtrils likewiſe in many were greatly inflamed and excoriated, continually dripping down a moſt ſharp ichor or ſanious matter, ſo exceſſively acrid, that it not only corroded the lips, cheeks, and hands of the children that laboured under the diſeaſe, but even the fingers and arms of the very nurſes that attended them: as this ulceration of the noſtrils came on, it commonly cauſed an almoſt inceſſant ſneezing in the children; but few adults were affected with it, at leaſt to any conſiderable degree. It was ſurpriſing what quantities of matter ſome children diſcharged this way, which they would often rub on their face, hands, and arms, and bliſter them all over. A ſudden ſtoppage of this rheum from the mouth and noſtrils actually choaked ſeveral children; and ſome ſwallowed ſuch quantities of it, as occaſioned excoriations of the inteſtines, violent gripings, dyſentery, &c. nay, even excoriations of the anus and buttocks. Not only the noſtrils, fauces, &c. were greatly affected by this extremely ſharp matter, but the wind-pipe itſelf was ſometimes much corroded by it, and pieces of its internal membrane were ſpit up, with much blood and corruption; and the patients lingered on for a conſiderable time, and at length died tabid; though there were more frequent inſtances of its falling ſuddenly and violently on the lungs, and killing in a peripneumonic manner.

Dr Huxham was aſtoniſhed ſometimes to ſee ſeveral ſwallow with tolerable eaſe, though the tumor of the tonſils and throat, the quantity of thick mucus, and the rattling noiſe in breathing, were very terrible; which he thinks pretty clearly ſhows, that this malignant quinſy was more from the acrimony and abundance of the humours than the violence of the inflammation.

Moſt commonly the angina came on before the exanthemata; but many times the cuticular eruption appeared before the ſore-throat, and was ſometimes very conſiderable, though there was little or no pain in the fauces: on the contrary, a very ſevere angina ſeized ſome patients that had no manner of eruption; and yet, even in theſe caſes, a very great itching and deſquamation of the ſkin ſometimes enſued; but this was chiefly in grown perſons, very rarely in children. In general, however, a very conſiderable efflореſcence broke out on the ſurface of the body, particularly in children; and it moſt commonly happened the ſecond, third, or fourth day: ſometimes it was partial, ſometimes it covered almoſt the whole body, though very ſeldom the face: ſometimes it was of an eryſipelatous kind; ſometimes more puſtular: the puſtules frequently eminent, and of a deep fiery red colour, particularly on the breaſt and arms; but oftentimes they were very ſmall, and might be better felt than ſeen, and gave a very odd kind of roughneſs to the ſkin. The colour of the effloreſcence was commonly of a crimſon hue, or as if the ſkin had been ſmeared over with juice of raſberries, and this even to the fingers ends; and the ſkin appeared inflamed and ſwoln, as it were; the arms, hands, and fingers, were often evidently ſo, and very ſtiff, and ſomewhat painful. This crimſon colour of the ſkin ſeemed indeed peculiar to this diſeaſe. Though the eruption ſeldom failed of giving ſome manifeſt relief to the patient, as to anxiety, ſickneſs at ſtomach, vomiting, purging, &c. yet there was obſerved an univerſal fiery eruption on ſome perſons, without the leaſt abatement of the ſymptoms, nay almoſt every ſymptom ſeemed more aggravated, particularly the fever, load at breaſt, anxiety, delirium; and our author knew more than one or two patients die in the moſt raging phrenzy, covered with the moſt univerſal fiery raſh he ever ſaw: ſo that, as in the

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the highly confluent small-pox, it seemed only to denote the quantity of the disease, as he terms it.

He had under his care a young gentleman, about 12 years of age, whose tongue, fauces, and tonsils, were as black as ink, and he swallowed with extreme difficulty; he continually spit off immense quantities of a black, sanious, and very fetid matter, for at least eight or ten days:—about the seventh day, his fever being somewhat abated, he fell into a bloody dysentery, though the bloody, sanious, fetid expectoration still continued, with a most violent cough. He at length indeed got over it, to the very great surprise of every one that saw him. Now, in this patient, a severe and universal rash broke out upon the second and third day; and the itching of his skin was so intolerable, that he tore it all over his body in a most shocking manner: yet this very great and timely eruption very little relieved his fever and phrenzy, or prevented the other dreadful symptoms mentioned,

An early and kindly eruption, however, was most commonly a very good omen; and, when succeeded by a very copious desquamation of the cuticle, one of the most favourable symptoms that occurred; but when the eruption turned of a dusky or livid colour, or prematurely or suddenly receded, every symptom grew worse, and the utmost danger impended, especially if purple or black spots appeared up and down, as sometimes happened; the urine grew limpid, and convulsions came on, or a fatal suffocation soon closed the tragedy.

The disease was generally at the height about the fifth or sixth day in young persons, in the elder not so soon; and the crisis many times was not till the 11th or 12th, and then very imperfect: some adults, however, were carried off in two or three days; the distemper either falling on the lungs, and killing in a peripneumonic manner; or on the brain, and the patient either died raving or comatose. In some, the disease brought on a very troublesome cough, purulent expectoration, hæmoptoë, and hectic; in which they lingered on for several weeks, and then died tabid.

If a gentle easy sweat came on the third or fourth day; if the pulse became more slow, firm, and equal; if the sloughs of the fauces cast off in a kindly manner, and appeared at the bottom tolerably clean and florid; if the breathing was more soft and free, and some degree of vigour and quickness returned in the eyes; all was well, and a salutary crisis followed soon by a continuance of the sweat, and a turbid, subsiding, farinaceous urine, a plentiful expectoration, and a very large desquamation of the cuticle. But if a rigor came on, and the exanthemata suddenly disappeared or turned livid; if the pulse grew very small and quick, and the skin remained hot and parched as it were, the breathing more difficult, the eyes dead and glassy, the urine pale and limpid, a phrenzy or coma succeeded, with a coldish clammy sweat on the face or extremities; life was despaired of; especially if a singultus and choaking or gulping in the throat attended, with sudden, liquid, involuntary, livid stools, intolerably fetid. In some few patients Dr Huxham observed, some time before the fatal period, not only the face bloated, sallow, shining, and greasy as it were, but the whole neck very much swoln, and of a cadaverous look; and even the whole body became in some degree œdematous; and the impression of a finger would remain fixed in a part, the skin not rising again as usual; an indication that the blood stagnated in the capillaries, and that the elasticity of the fibres was quite lost.

Cynanche.

Medical writers are still much divided in opinion, whether the cynanche maligna is to be considered as the same disease with the scarlatina anginosa, afterwards to be treated of, or not. This question will afterwards come to be more fully discussed. At present we may only observe, that although ulcerous sore throats of a malignant nature often appear sporadically, yet that the disease above described appears only as an epidemic, and is always the consequence of contagion.

Prognosis. This may be easily gathered from the above description. The malignant and putrid tendency of the disease is evident, and an increase of the symptoms which arise from that putrescent disposition of the body must give an unfavourable prognostic; as, on the contrary, a decrease of these, and an apparent increase of the *vis vitæ*, are favourable: in general, what is observed to be favourable in the nervous and putrid malignant fevers, is also favourable in this, and *vice versa*.

Causes. Since the accurate accounts given by Dr Fothergill and Huxham of the epidemics which prevailed about 50 years ago, this disease has frequently been observed at times epidemic in almost every different part of Britain. Like small-pox, measles, and chin-cough, it seems in every case to be the effect of a peculiar and specific contagion. It has been observed to prevail, equally generally in every situation, and at every season; and on exposure to the contagion, no age, sex, or condition, is exempted from it. But the having once had the disease, seems in this affection to afford the same security against future contagion as in the small-pox: at least instances, where it can be said that the same individual has been twice affected with it, are both very rare and very doubtful, as well as in small-pox.

Cure. Like other febrile contagions, the malignant ulcerous sore throat is terminated only by a natural course; and the chief business of the practitioner is to combat unfavourable occurrences. In this the septic tendency of the disease is chiefly to be kept in view. The debility with which it is attended renders all evacuations by bleeding and purging improper, except in a few instances where the debility is less, and the inflammatory symptoms more considerable. The fauces are to be preserved from the effects of the acrid matter poured out upon them, and are therefore to be frequently washed out by antiseptic gargles or injections; and the putrescent state of the whole system should be guarded against and corrected by internal antiseptics, especially by the Peruvian bark given in the beginning and continued through the course of the disease. Great benefit is also often derived from the liberal use of the mineral acids. Both the vitriolic and muriatic, in a state of proper dilution, have been highly extolled by different medical writers, and are productive of the best effects in actual practice, when they can be introduced to a sufficient extent. Emetics, both by vomiting and nauseating, prove useful. When any considerable tumor occurs, blisters applied exter-

Cynanche. externally will be of service, and in any case may be proper to moderate the inflammation.

Very lately, the internal use of the capsicum annuum, or Cayenne pepper as it is commonly called, has been highly celebrated in this affection; and it is particularly said to have been employed with singular success in the West Indies.

180 Sp. III. Cynanche trachealis. The Croup

Cynanche trachealis, *Sauv.* sp. 5.
Cynanche laryngea auctorum, *Eller* de cogn. et curand. morb. sect. 7.
Anginæ inflammatoriæ, sp. 1. *Boerh.* 801.
Angina latens et difficilis, *Dodon.* obs. 18.
Angina interna, *Tulp.* l. 1. obs. 51.
Angina perniciosa, *Greg. Horst.* Obs. l. iii. obs. 1.
Suffocatio stridula, *Home* on the Croup.
Asthma infantum, *Millar* on the Asthma and Chincough.
Asthma infantum spasmodicum, *Rush*, Dissertation, Lond. 1770.
Cynanche stridula, *Crawford* Dissert. Inaug. Edin. 1771.
Angina epidemica anno 1743. *Molloy* apud *Rutty's* History of the weather.
Morbus strangulatorius, *Starr*, Phil. Transf. n° 495.
Morbus truculentus infantum, *Francof.* ad Viadrum et in vicinia grassans ann. 1758. C. a Bergen. A nova. N. C. tom. ii. p. 157.
Catarrhus suffocativus Barbadensis ann. 1758. *Hillary's* Diseases of Barbadoes.
Angina inflammatoria infantum, *Russel*, Oecon. nat. p. 70.
Angina polyposa sive membranacea *Michaelis.* Argentorati 1778, et auctores ab eo allegati.

The best description of this disease we have in Dr Cullen's Practice of Physic. He informs us, that it consists in an inflammation of the glottis, larynx, or upper part of the trachea, whether it affect the membranes of these parts or the muscles adjoining. It may arise first in these parts, and continue to subsist in them alone; or it may come to affect these parts from the cynanche tonsillaris, or maligna, spreading into them.

In either way it has been a rare occurrence, and few instances of it have been marked and recorded by physicians. It is to be known by a peculiar croaking sound of the voice, by difficult respiration, with a sense of straitening about the larynx, and by a pyrexia attending it.

From the nature of these symptoms, and from the dissection of the bodies of persons who died of this disease, there is no doubt of its being of an inflammatory kind. It does not, however, always run the course of inflammatory affections; but frequently produces such an obstruction of the passage of the air, as suffocates, and thereby proves suddenly fatal.

It particularly proves fatal, in consequence of the trachea being obstructed by a membranous substance lining the inside of it, and very nearly approaching in appearance to the inflammatory exudation often discovered on the intestinal canal in those dying of enteritis.

If we judge rightly of the nature of this disease, it will be obvious, that the cure of it requires the most powerful remedies of inflammation to be employed upon the very first appearance of the symptoms. When a suffocation is threatened, whether any remedies can be employed to prevent it, is not yet determined by sufficient experience: but it is evident, that in certain cases the life of the patient can be preserved only by the removal of that matter which obstructs the passage of air through the trachea.

The accounts which books have hitherto given us of inflammations of the larynx, and the parts connected with it, amount to what we have now said; and many instances are recorded of the disease happening in adult persons: but there is a peculiar affection of this kind happening to infants, which has been little taken notice of till lately. Dr Home is the first who has given any distinct account of this disease; but, since he wrote, several other authors have taken notice of it, and have given different opinions concerning it.

This disease seldom attacks infants till after they have been weaned. After this period, the younger they are, the more they are liable to the disease. The frequency of it becomes less as children become more advanced; and there are few instances of children above 12 years of age being affected with it. It attacks children of the midland countries, as well as those who live near the sea; but it occurs much more frequently at certain places than at others. It does not appear to be contagious; and its attacks are frequently repeated in the same child. It is often manifestly the effect of cold applied to the body; and therefore appears most frequently in the winter and spring seasons. It very commonly comes on with the ordinary symptoms of a catarrh; but sometimes the peculiar symptoms of the disease show themselves at the very first.

These peculiar symptoms are the following: A hoarseness, with some shrillness and ringing sound, both in speaking and coughing, as if the noise came from a brazen tube. At the same time, there is a sense of pain about the larynx, some difficulty of respiration, with a whizzing sound in inspiration, as if the passage of the air were straitened. The cough which attends it, is commonly dry; and if any thing be spit up, it is a matter of a purulent appearance, and sometimes films resembling portions of a membrane. With all these symptoms, there is a frequency of pulse, a restlessness, and an uneasy sense of heat. When the internal fauces are viewed, they are sometimes without any appearance of inflammation; but frequently a redness, and even swelling, appears; and sometimes there is an appearance of matter like to that rejected by coughing, together with the symptoms now described, and particularly with great difficulty of breathing, and a sense of strangling in the fauces, by which the patient is sometimes suddenly taken off.

Many dissections have been made of infants who had died of this disease, and almost constantly there has appeared a preternatural substance, apparently membranous, lining the whole internal surface of the upper part of the trachea, and extending in the same manner

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manner downwards into some of its ramifications. This preternatural membrane may be easily separated, and sometimes has been found separated in part, from the subjacent proper membrane of the trachea. This last is commonly found entire, that is, without any appearance of erosion or ulceration; but it frequently shows the vestiges of inflammation, and is covered by a matter resembling pus, like to that rejected by coughing; and very often a matter of the same kind is found in the bronchiæ, sometimes in considerable quantity.

From the remote causes of this disease; from the catarrhal symptoms commonly attending it; from the pyrexia constantly present with it; from the same kind of preternatural membrane being found in the trachea when the cynanche maligna is communicated to it; and from the vestiges of inflammation on the trachea discovered upon dissection; we must conclude, that this disease consists in an inflammatory affection of the mucous membrane of the larynx and trachea, producing an exudation analogous to that found on the surface of inflamed viscera, and appearing partly in a membranous crust, and partly in a fluid form resembling pus.

Though this disease consists in an inflammatory affection, it does not commonly end either in suppuration or gangrene. The troublesome circumstance of it seems to consist in a spasm of the muscles of the glottis, threatening suffocation.

When this disease terminates in health, it is by resolution of the inflammation, by ceasing of the spasm of the glottis, by an expectoration of the matter exuding from the trachea, and of the crusts formed there, and frequently it ends without any expectoration, or at least with such only as attends an ordinary catarrh. But in some instances, a salutary termination has very speedily taken place, in consequence of the discharge of the membranous substance from the trachea, even under its proper tubular form.

When the disease ends fatally, it is by a suffocation seemingly depending upon a spasm affecting the glottis; but sometimes, probably, depending upon a quantity of matter filling the bronchiæ, or obstructing the trachea.

As we suppose the disease to be an inflammatory affection, so we attempt the cure of it by the usual remedies of inflammation. Bleeding, both general and topical, has often given immediate relief, and, by being repeated, has entirely cured the disease. Blistering also, near to the part affected, has been found useful. Upon the first attack of the disease, vomiting, immediately after bleeding, seems to be of considerable use, and sometimes suddenly removes the disease. But emetics are still more useful in advanced periods. By the employment of these, the matter obstructing the trachea, and inducing spasmodic affections, has often been successfully removed, when the situation of the patient seemed to be almost desperate. And as in the progress of the disease fresh effusions of this matter are very apt to take place, the frequent repetition of emetics becomes necessary. It is often necessary to have recourse to those operating the most expeditiously, such as vitriolated zinc even in large doses. In every stage of the disease, the antiphlogistic regimen is necessary, and particularly the frequent use of laxative glysters. Though we suppose that a spasm affecting the glottis is often fatal in this disease, antispasmodic medicines have not in general been found of great service. Some, however, have strongly recommended the use of asafœtida under the form of injection; others place great confidence in oil, or oily mixtures, taken by the mouth: but more immediate benefit is derived from tepid bathing, and the employment of vitriolic ether, both externally and internally.

Cynanche.

Sp. IV. Cynanche pharyngea. 181

Cynanche pharyngea, *Sauv.* sp. 6. *Eller* de cogn. et cur. sect. 7.

Anginæ inflammatoriæ, sp 4. *Boerh.* 804.

This is not materially different from the cynanche tonsillaris; only that the inflammation is said to begin in the pharynx, though Dr Cullen says he never knew an instance of it. The symptoms are almost the same, and the cure is precisely so with that of the cynanche tonsillaris.

Sp. V. Cynanche parotidæa. 182

Cynanche parotidæa, *Sauv.* sp. 14. *Gallis* Oreillons et Ourles, *Tissot* Avis au peuple, n° 116. *Encyclopedie*, au mot *Oreillons*.

Angina externa, *Anglis* the Mumps, *Russel* œcon. natur. p. 114. *Scotis* the Branks.

Catarrhus Bellinsulanus, *Sauv.* sp. 4.

Osservazioni di *Girol. Gaspari*, Venez. 1731.

Osservazioni di *Targ. Tozetti*, Racolta 1ma, p. 176.

This is a disease well known to the vulgar, but little taken notice of by medical writers. It is often epidemic, and manifestly contagious. It comes on with the usual symptoms of pyrexia, which is soon after attended with a considerable tumor of the external fauces and neck. The swelling appears first as a glandular moveable tumor at the corner of the lower jaw; but it soon becomes uniformly diffused over a great part of the neck, sometimes on one side only, but more commonly on both. The swelling continues to increase till the fourth day; but from that period it declines, and in a few days more goes off entirely. As the swelling of the fauces recedes, it not unfrequently happens that some tumor affects the testicles in the male sex, or the breasts in the female. These tumors are sometimes large, hard, and somewhat painful; but are seldom either very painful or of long continuance. The pyrexia attending this disease is commonly slight, and goes off with the swelling of the fauces; but sometimes, when the swelling of the testicles does not succeed to that of the fauces, or when the one or the other has been suddenly repressed, the pyrexia becomes more considerable, is often attended with delirium, and has sometimes proved fatal.

As this disease commonly runs its course without either dangerous or troublesome symptoms, so it hardly requires any remedies. An antiphlogistic regimen, and avoiding cold, are all that will be commonly necessary. But when, upon the receding of the swellings, the pyrexia comes to be considerable, and threatens an affection of the brain, it will be proper, by warm fomentations,

ma- mentations, to bring back the ſwelling; and by vomit-
e ing, bleeding, or bliſtering, to obviate the conſequences of its abſence.

3 Genus XI. PNEUMONIA.

Febris pneumonica, *Hoffm.* II. 136.

4 Sp. I. Peripneumonia.

Peripneumony, or Inflammation of the Lungs.

Peripneumonia, *Sauv.* gen. 112. *Lin.* 34. *Vog.* 51. *Sag.* gen. 311. *Boerh.* 820. *Juncker* 67.
Peripneumonia pura ſive vera Auctorum, *Sauv.* ſp. 1.
Peripneumonia gaſtrica, *Sauv.* ſp. 11. *Morgagn.* de cauſ. et ſed. Epiſt. xx. art. 30, 31.
Peripneumonia catarrhalis, *Sauv.* ſp. 6.
Peripneumonia notha, *Sydenh.* ſect. 6. cap. 4. *Boerh.* 867. *Morgagni* de cauſ. et ſed. Epiſt. xxi. 11.—15.
Peripneumonia putrida, *Sauv.* ſp. 2.
Peripneumonia ardens, *Sauv.* ſp. 3.
Peripneumonia maligna, *Sauv.* ſp. 4.
Peripneumonia typhodes, *Sauv.* ſp. 5.
Amphimerina peripneumonica, *Sauv.* ſp. 15.

5 Sp. II. Pleuritis.

The *Pleuriſy*, or Inflammation of the Pleura.

Pleuritis, *Sauv.* gen. 103. *Lin.* 27. *Vog.* 56. *Sag.* gen. 303. *Boerh.* 875. *Junck.* 67.
Paraphrenefis, *Sauv* gen. 102. *Lin.* 26.
Paraphrenitis, *Vog.* 55. *Boerh.* 907.
Diaphragmitis, *Sag* gen. 304.
Pleuritis vera, *Sauv.* ſp. 1. *Boerh.* 875. *Verna* princeps morb. acut. pleuritis, l. 1. cap. 2. 3. *Zeviani* della parapleuritide, cap. 3. *Morgagni* de ſed. et cauſ morb. Epiſt. xx. art. 56. xxi. 45. *Wendt* de pleuritide, apud *Sandifort*, theſ ii.
Pleuritis pulmonis, *Sauv.* ſp. 2. *Zevian.* dell. parapleur. iii. 28, &c.
Pleuropneumonia, pleuro-peripneumonia, peripneumo-pleuritis Auctorum. *Baronius* de pleuri-pneumonia. Ill. *Halleri* opuſcul. patholog obſ. 13. *Morgagni* de ſed. et cauſ. Epiſt. xx. and xxi. paſſim. *Cleghorn*, Minorca, p. 247. *Triller* de pleuritide, aph. 1, 2, 3 cap. i. 8. *Huxham*, Diſſert on pleuriſies, &c. chap. i. Ill. *Pringle*, Diſ. of the army.
Pleuritis convulſiva, *Sauv.* ſp. 13. *Bianch.* Hiſt. hep. vol. i. p. 234.
Pleuritis hydrothoracica, *Sauv.* ſp. 15. *Morgagni* de cauſ. et ſed. xx. 34.
Pleuritis dorſalis, *Sauv.* ſp. 3. *Verna*, p. 3. cap. 8.
Pleuritis mediaſtini, *Sauv.* ſp 3. *P. Sal. Div.* de affec. part. cap. 6. *Friend*, Hiſt. Med. de Avenzoare.
Mediaſtina, *Vog.* 52.
Pleuritis pericardii, *Sauv.* ſp. 5. *Verna*, p. iii. cap. 9.
Parapleuritis, *Zeviani* della parapleuritide.
Pleurodyne parapleuritis, *Sauv.* ſp. 19.
Paraphrenefis diaphragmatica, *Sauv.* ſp. 1. *De Haen.* Rat. med. i. 7. iii. p. 31.
Paraphrenefis pleuritica, *Sauv.* ſp. 2.
Paraphrenefis hepatica, *Sauv.* ſp. 3.

Under the general head of *Pneumonia*, Dr Cullen comprehends all inflammations of the thoracic viſcera, or membrane lining the inſide of that cavity; as the ſymptoms do not ſufficiently diſtinguiſh the ſeat of the affection, nor does a difference in the ſituation of the affected place make any difference in the cure. Pneumonia.

Deſcription. Pneumonic inflammation, however various in the ſeat, always diſcovers itſelf by pyrexia, difficult breathing, cough, and pain in ſome part of the thorax. It almoſt always comes on with a cold ſtage, and is accompanied with the other ſymptoms of pyrexia; though in ſome few inſtances the pulſe may not be more frequent, nor the heat of the body increaſed beyond what is natural. Sometimes the pyrexia is from the beginning accompanied with the other ſymptoms; but frequently it is formed ſome hours before them, and particularly before the pain be felt. The pulſe for the moſt part is frequent, full, ſtrong, hard, and quick; but, in a few inſtances, eſpecially in the advanced ſtate of the diſeaſe, it is weak, ſoft, and at the ſame time irregular. The difficulty of breathing is moſt conſiderable in inſpiration, both becauſe the lungs do not eaſily admit of a full dilatation, and becauſe the dilatation increaſes the pain attending the diſeaſe. The difficulty of breathing is alſo greater when the patient is in one poſture of the body rather than another. It is generally greater when he lies on the ſide affected; though ſometimes the contrary happens. Very often the patient cannot lie eaſy upon either ſide, and can find eaſe only when lying on the back; and ſometimes he cannot breathe eaſily, except when in ſomewhat of an erect poſture. The cough, in different caſes, is more or leſs urgent or painful It is ſometimes dry, or without any expectoration, eſpecially in the beginning of the diſeaſe; but more commonly it is, even from the beginning, moiſt, and the matter ſpit up various both in conſiſtence and colour, and frequently it is ſtreaked with blood. The pain is alſo different in different caſes, and felt in different parts of the thorax, but moſt frequently in one ſide. It has been ſaid to affect the right ſide more frequently than the left; but this is uncertain, and we are ſure that the left ſide has been very often affected. Sometimes it is felt as if it was under the ſternum; ſometimes in the back between the ſhoulders; and when in the ſides, its place has been higher or lower, more forward or backward; but the place of all moſt frequently affected is about the ſixth or ſeventh rib, near the middle of its length, or a little more forward. The pain is often ſevere and pungent; but ſometimes more dull and obtuſe, with a ſenſe of weight rather than of pain. It is moſt eſpecially ſevere and pungent when occupying the place laſt mentioned. For the moſt part it continues fixed in one part, but ſometimes ſhoots from the ſide to the ſcapula on one hand, or to the ſternum and clavicle on the other.

Dr Cullen ſuppoſes that the diſeaſe is always ſeated, or at leaſt begins, in ſome part of the pleura, taking that membrane in its greateſt extent, as now commonly underſtood; that is, as covering not only the internal ſurface of the cavity of the thorax, but alſo as forming the mediaſtinum, and as extended over the pericardium, and over the whole ſurface of the lungs. But as the ſymptoms never clearly indicate where

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where the seat of the disease is, there is but little foundation for the different names by which it has been distinguished. The term *pleurisy* is improperly limited to that inflammation which begins in and chiefly affects the pleura costalis. This our author thinks is a rare occurrence; and that the pneumonia much more frequently begins in the pleura investing the lungs, producing all the symptoms which belong to what hath been called the *pleuritis vera*. The word *peripneumony* has been applied to an inflammation beginning in the parenchyma, or cellular texture of the lungs, and having its seat chiefly there. But to Dr Cullen it seems very doubtful if any acute inflammation of the lungs, or any disease which has been called *peripneumony*, be of that kind. It seems probable, that every acute inflammation begins in membranous parts; and in every dissection of persons who have died of peripneumony, the external membrane of the lungs, or some part of the pleura, has appeared to have been considerably affected. An inflammation of the pleura covering the upper surface of the diaphragm, has been distinguished by the appellation of *paraphrenitis*, as supposed to be attended with the peculiar symptoms of delirium, *risus sardonicus*, and other convulsive motions: but it is certain, that an inflammation of that portion of the pleura, and affecting also even the muscular substance of the diaphragm, has often taken place without any of the symptoms above-mentioned; and neither the dissections which have fallen under Dr Cullen's observation, nor any accounts of dissections, support the opinion that an inflammation of the pleura covering the diaphragm is attended with delirium more commonly than any other pneumonic inflammation.—It is to be observed, however, that though the inflammation may begin in one particular part of the pleura, the morbid affection is commonly communicated to the whole extent of the membrane.

The pneumonic inflammation, like others, may terminate by resolution, suppuration, or gangrene: but it has also a termination peculiar to itself; namely, when it is attended with an effusion of blood into the cellular texture of the lungs, which, soon interrupting the circulation of the blood through the viscus, produces a fatal suffocation. This indeed appears to be the most common termination of pneumonic inflammation when it ends fatally; for upon the dissection of almost every person who has died of this disease, it appears that such an effusion had happened. From the same dissections we learn, that pneumonic inflammation commonly produces an exsudation from the internal surface of the pleura, which appears partly as a soft viscid crust, often of a compact membranous form, covering every where the surface of the pleura, and particularly those parts where the lungs adhere to the pleura costalis, or mediastinum; and this crust seems always to be the cement of such adhesion. The same exsudation shows itself also by a quantity of a serous fluid commonly found in the cavity of the thorax; and some exsudation or effusion is usually found to have been made into the cavity of the pericardium. It seems likewise probable, that an effusion of this kind is sometimes made into the cavity of the bronchiæ; for in some persons who have died after labouring under a pneumonic inflammation for a few days only, the bronchiæ have been found filled with a considerable quantity of serous and thickish fluid, which must be considered rather as the effusion abovementioned, having had its thinner parts taken off by respiration, than as a pus so suddenly formed in the inflamed part. It is, however, not improbable, that this effusion, as well as that made into the cavities of the thorax and pericardium, may be a matter of the same kind with that which in other inflammations is poured into the cellular texture of the parts inflamed, and there converted into pus; but in the thorax and pericardium it does not always put on this appearance, because the crust covering the surface prevents the absorption of the thinner part. This absorption, however, may be compensated in the bronchiæ, by the drying power of the air; and therefore the effusion into them may assume a more purulent appearance. In many cases of pneumonic inflammation, when the expectoration is very copious, it is difficult to suppose that the whole proceeds from the mucous follicles of the bronchiæ; and it seems probable that a great part of it may come from the effused serous fluid just mentioned; and this too will account for the appearance of the expectoration being so often purulent. Perhaps the same thing will account for that purulent matter found in the bronchiæ, which Mr de Haen says he had often observed when there was no ulceration in the lungs, and which he accounts for in a very strange manner, namely, by supposing a pus formed in the circulating blood.

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Dr Cullen is of opinion, that the effusion into the bronchiæ above-mentioned often concurs with the effusion of red blood into the cellular substance of the lungs to occasion the fatal suffocation which frequently terminates peripneumony: that the effusion of serum alone may have this effect: and that the serum poured out in a certain quantity, rather than any debility in the powers of expectoration, is the cause of that cessation of spitting which precedes the fatal event; for in many cases the expectoration has ceased, when no other symptoms of debility have appeared, and when, upon dissection, the bronchiæ have been full of liquid matter. Nay, it is even probable, that in some cases such an effusion may take place without any symptoms of violent inflammation; and in other cases the effusion taking place may seem to remove the symptoms of inflammation which had appeared before, and thus account for those unexpected fatal terminations which have sometimes happened.

Pneumonic inflammation seldom terminates by resolution, without being attended with some evident evacuation. An hæmorrhagy from the nose happening on some of the first days of the disease has sometimes put an end to it; and it is said, that an evacuation from the hæmorrhoidal veins, a bilious evacuation by stool, and an evacuation of urine with a copious sediment, have severally had the same effect; but such occurrences have been rare. The evacuation most frequently attending, and seeming to have the greatest effect in promoting resolution, is an expectoration of a thick, white, or yellowish matter, a little streaked with blood, copious, and brought up without much or violent coughing. Very frequently the resolution of this disease is attended with, and perhaps produced by, a sweat, which is warm, fluid, copious, over the whole body, and attended with an abatement of the frequency of the

Pneumonia. the pulse, heat of the body, and other febrile symptoms. Although, from the history now given, it appears that pleurisy and peripneumony cannot with propriety be considered as different diseases, yet it is certain that in different cases this affection occurs with an assemblage of symptoms separate and distinct. Thus even Dr Cullen himself, in his Nosology, has defined pleuritis to consist in pyrexia, attended with pungent pain of the side, painful respiration, difficulty of lying down, particularly on the affected side, and distressing cough, in the beginning dry, but afterwards humid, and often with bloody expectoration. While again he has defined peripneumony to consist in pyrexia, attended with a dull pain under the sternum and between the shoulders, anxiety, difficulty of breathing, humid cough, expectoration generally bloody, a soft pulse, and a tumid livid appearance of the countenance. It is highly probable, that the first of these sets of symptoms chiefly arises from a state of active inflammation, and the second from effusion. Thus, in certain cases, the symptoms may appear perfectly separate and distinct; but more frequently both inflammation and effusion are united; and thus the symptoms in both definitions are in general combined in the same patient.

Causes of, and persons subject to, this disorder. The remote cause of pneumonic inflammation is commonly cold applied to the body, obstructing perspiration, and determining to the lungs, while at the same time the lungs themselves are exposed to the action of cold. These circumstances operate chiefly when an inflammatory diathesis prevails in the system; and therefore those principally affected with this disease are persons of the greatest vigour, in cold climates, in the winter season, and particularly in the spring, when vicissitudes of heat and cold are frequent. This disease, however, may arise in any season when such varieties take place. Other remote causes also may have a share in producing this distemper; such as every means of obstructing, straining, or otherwise injuring, the pneumonic organs. The pneumonic inflammation has sometimes been so much an epidemic, that it hath been suspected of depending on a specific contagion; but Dr Cullen never met with an instance of its being contagious.

Prognosis. In pneumonic inflammations, a violent pyrexia is always dangerous. The danger, however, is chiefly denoted by the difficulty of breathing. When the patient can lie on one side only; when he can lie on neither side, but only on his back; when he cannot breathe with tolerable ease, except when the trunk of his body is erect; when even in this posture the breathing is very difficult, and attended with a turgescence and flushing of the face, with partial sweats about the head and neck, and an irregular pulse; these circumstances mark the difficulty of breathing in different degrees; and consequently, in proportion, the danger of the disease. A frequent violent cough, aggravating the pain, is always the symptom of an obstinate disease; and as the disease is seldom or never resolved without some expectoration, so a dry cough must always be an unfavourable symptom

The proper characteristics of the expectoration have been already laid down; and though an expectoration which has not these marks must indicate a doubtful state of the disease, yet the colour alone can give no certain prognostic. An acute pain, very much interrupting inspiration, is always the mark of a violent disease; but not of a more dangerous disease than an obtuse pain attended with very difficult respiration.

When the pains, which had at first affected one side only, shall afterwards spread into the other; or when, leaving the side first affected, they pass entirely into the other; these are always marks of a dangerous disease. A delirium coming on during a pneumonic inflammation is always a symptom denoting much danger.

When pneumonic disorders terminate fatally, it is on one or other of the days of the first week, from the third to the seventh. This is the most common case: but, in a few instances, death has happened at a later period. When the disease is violent, but admitting of resolution, this also happens frequently in the course of the first week; but in a more moderate disease the resolution is often put off to the second week. The disease generally suffers a remission on some of the days from the third to the seventh: which, however, may be often fallacious, as the disease sometimes returns again with as much violence as before; and in such a case with great danger. Sometimes it disappears on the third day, while an erysipelas makes its appearance on some external part; and if this continue fixed, the pneumonic inflammation does not recur. If the disease continue beyond the 14th day, it will terminate in a suppuration, or PHTHISIS. The termination by gangrene is much more rare than has been imagined: and when it does occur, it is usually joined with the termination by effusion: the symptoms of the one being hardly distinguishable from those of the other.

Cure. This must proceed upon the general plan mentioned under SYNOCHA; but, on account of the importance of the part affected, the remedies must be employed early, and as fully as possible: and these are chiefly directed with one of three views, viz. for obtaining a resolution of the inflammation in the thorax, for mitigating the urgent symptoms before a resolution can be effected, and for counteracting or obviating the consequences of the disease. Venesection is the remedy chiefly to be depended on; and may be done in either arm, as the surgeon finds most convenient; and the quantity taken away ought in general to be as large as the patient's strength will allow. The remission of pain, and the relief of respiration, during the flowing of the blood, may limit the quantity to be then drawn; but if these symptoms of relief do not appear, the bleeding should be continued to a considerable extent, unless symptoms of a beginning syncope come on. It is seldom that one bleeding, however large, will cure this disease; and though the pain and difficulty of breathing may be much relieved by the first bleeding, these symptoms commonly and after no long interval recur, often with as much violence as before. In this case the bleeding is to be repeated even on the same day, and perhaps to the same quantity as before. Sometimes the second bleeding may be larger than the first. There are persons who, by their constitution, are ready to faint even upon a small bleeding; and in such persons this may prevent the drawing so much blood at first as a pneumonic inflammation may require: but as the same persons are found

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found to bear after-bleedings better than the first, this allows the second and subsequent bleedings to be larger, and to such a quantity as the symptoms of the disease may seem to require.

Bleedings are to be repeated according to the state of the symptoms, and they will be more effectual when practised in the course of the first three days than afterwards; but they are not to be omitted though four days of the disease may already have elapsed. If the physician has not been called in time, or the first bleedings have not been sufficiently large, or even though they should have procured some remission, yet upon the return of the urgent symptoms, bleeding may be repeated at any time within the first fortnight, or even after that period, if a suppuration be not evident, or if after a seeming solution the disease shall have returned.

With respect to the quantity of blood which may be taken away with safety, no general rules can be given; as it must be very different according to the state of the disease, and the constitution of the patient. In an adult male of tolerable strength, a pound avoirdupois of blood is a full bleeding. Any quantity above 20 ounces is a large, and any quantity below 12 is a small, bleeding. An evacuation of four or five pounds, in the course of two or three days, is generally as much as most patients will bear; but if the intervals between the bleedings, and the whole of the time during which the bleedings have been employed, have been long, the quantity taken upon the whole may be greater.

When a large quantity of blood hath been taken from the arm, and it is doubtful if more can be taken in that manner with safety, some blood may still be taken by cupping and scarifying. This will especially be proper, when the recurrence of the pain, rather than the difficulty of breathing, becomes the urgent symptom; and then the cupping and scarification should be made as near as possible to the pained part.

An expectoration sometimes takes place very early in this disease; but if the symptoms continue urgent, the bleedings must be repeated notwithstanding the expectoration: but in a more advanced state, and when the symptoms have suffered a considerable remission, we may then trust the cure to the expectoration alone. It is not observed that bleeding, during the first days of the disease, stops expectoration; on the contrary, it hath been often found to promote it; and it is only in a more advanced state of the disease, when the patient has been already exhausted by large evacuations and a continuance of his illness, that bleeding seems to put a stop to expectoration; and even then, this stoppage seems not to take place so much from the powers of expectoration being weakened by bleeding, as by its favouring the serous effusion in the bronchiæ, already taken notice of.

Besides bleeding, every part of the antiphlogistic regimen ought here to be carefully employed: the patient must keep out of bed as much as he can bear; must have plenty of warm diluting drinks, impregnated with vegetable acids, accompanied with nitre or some other cooling neutral salt; and the belly also ought to be kept open by emollient glysters or cooling laxative medicines. Vomiting in the beginning is dangerous; but in a somewhat advanced state of the disease emetics have been found the best means of promoting expectoration. Fomentations and poultices to the pained part have been found useful; but blistering is found to be much more effectual. A blister, however, ought not to be applied till at least one bleeding hath been premised, as venesection is less effectual when the irritation of a blister is present. If the disease be moderate, a blister may be applied immediately after the first bleeding; but in violent cases, where it may be presumed that a second bleeding may soon be necessary after the first, it will be proper to delay the blister till after the second bleeding, when it may be supposed that the irritation occasioned by the blister will be over before another bleeding becomes necessary. It may frequently be of use in this disease to repeat the blistering; and in that case the plasters should always be applied somewhere on the thorax, for when applied to more distant parts they have little effect. The keeping the blistered parts open, and making what is called a *perpetual blister*, has much less effect than a repeated blistering.

Pneumonia.

Many methods have been proposed for promoting expectoration, but none appear to be sufficiently effectual; and some of them, being acrid stimulant substances, are not very safe. The gums usually employed seem to be too heating; the squills less so; but they are not very powerful, and sometimes inconvenient, by the constant nausea they occasion. The volatile alkali may be of service as an expectorant, but it ought to be reserved for an advanced state of the disease. Mucilaginous and oily demulcents appear to be useful, by allaying that acrimony of the mucus which occasions too frequent coughing; and which coughing prevents the stagnation and thickening of the mucus, and thereby its becoming mild. The receiving into the lungs the steams of warm water, impregnated with vinegar, has often proved useful in promoting expectoration; and, for this purpose, the machine called the INHALER, lately invented by Dr Mudge of Plymouth, promises to be of great service. But of all others, the antimonial emetics, given in nauseating doses, promise to be the most powerful for promoting expectoration. The kermes mineral hath been greatly recommended; but doth not seem to be more efficacious than emetic tartar or antimonial wine; and the dose of the kermes is much more uncertain than that of the others.

Though this disease often terminates by a spontaneous sweating, this evacuation ought not to be excited by art, unless with much caution. When, after some remission of the symptoms, spontaneous sweats arise, they may be encouraged; but it ought to be without much heat, and without stimulant medicines. If, however, the sweats be partial and clammy only, and a great difficulty of breathing still remain, it will be very dangerous to encourage them.

Physicians have differed much with regard to the use of opiates in pneumonic affections. It appears, however, that, in the beginning of the disease, and before bleeding and blistering have produced some remission of the pain, and of the difficulty of breathing, opiates have a bad tendency, by their increasing the difficulty of breathing and other inflammatory symptoms. But in a more advanced state of the disease, when the difficulty of breathing has abated, and when the urgent symptom is a cough, proving the chief cause of the continuance of pain and want of rest, reft, opiates may be employed with great advantage and fafety. The interruption of the expectoration which they feem to occafion, is for a fhort time only; and they feem often to promote it, as they occafion a ftagnation of what was by frequent coughing diffipated infenfibly: and therefore give the appearance of what phyficians have called *concocted matter*.

Opium combined with calomel has of late been highly extolled in this and other inflammatory difeafes by Dr Hamilton of Lynn-Regis; who has given a full account of the fuccefs attending his practice with this remedy, for the fpace of 16 years, in the 9th volume of the Edinburgh Medical Commentaries. And fince his recommendation, the fame remedy has often been employed by others with great benefit.

16 *Vomica*, or *Abfcefs* of the *Lungs*.

Vomica, *Boerh.* 835, *Junck.* 35.
Pleurodyne vomica, *Sauv.* fp. 21.

This fometimes follows pneumonia, though the cafe is not frequent. The fymptoms of it fo much refemble the phthifis, that it can moft properly be treated of under that head.

17 Empyema.

This is another confequence of a pneumonia terminating unfavourably, and is occafioned by the effufion of a quantity of purulent matter into the cavity of the thorax, producing a lingering and painful diforder, very often incurable.

Defcription. The firft fign of an empyema is a ceffation of the pain in the breaft, which before was continual: this is followed by a fenfation of weight on the diaphragm; and a fluctuation of matter, fometimes making a noife that may be heard by the byftanders: the acute fever is changed into a hectic, with an exacerbation at night: a continual and troublefome dry cough remains. The refpiration is exceedingly difficult, becaufe the lungs are prevented by the matter from fully expanding themfelves The patient can lie eafily on that fide where the matter is effufed, but not on the other, becaufe then the weight of the matter on the mediaftinum produces uneafinefs. The more the hectic heat is augmented, the more is the body emaciated, and its ftrength decayed. In fome there is danger of fuffocation when they ftoop down, which goes off when they alter that pofture of the body; and in fome there is a purulent fpitting.—Thefe fymptoms are accompanied with great anxiety, palpitations of the heart, and faintings. Sometimes the patients have a fenfation like a hot vapour afcending from the cavity of the thorax to their mouth. Others, in a more advanced ftate of the difeafe, have a putrid tafte in the mouth. At the fame time, profufe night-fweats wafte the body, and greatly weaken the patient. The face at firft grows red on that fide where the matter lies, at laft the Hippocratic face comes on, and the eyes become hollow. The pulfe, efpecially on the affected fide, is quick, but more frequently intermitting. Sometimes the nails are crooked, and puftules appear on the thorax; and frequently, according to the teftimony of Hippocrates, the feet fwell, and, on the affected fide of the breaft, there is an inflation and fwelling of the fkin.

Empyema.

Caufes, &c. An empyema may arife either from the burfting of a vomica of the lungs, or from a fuppuration taking place after the inflammatory ftage of the pneumonia; or fometimes from a fuppuration in the cafe of a quinfy, when the inflammation had extended to the afpera arteria, from whence arifes a kind of bloody fpittle, and the patients are afflicted with an empyema, unlefs they die on the 7th day of the difeafe, according to the obfervation of Hippocrates. It may arife alfo from external violence, as wounds of the thorax, &c. blood extravafated, corrupted, or changed into pus Like the vomica, it is a rare diftemper, but may attack all thofe fubject to pneumonia.

Prognofis. Very few recover after an empyema has been once formed, efpecially if the operation of paracentefis be neglected. After this operation is performed, if a great quantity of bloody fetid pus be difcharged, if the fever continue, and if the patient fpit up a purulent, pale, frothy, livid, or green matter, with a decay of ftrength, there is no hope: But when a fmall quantity of pus, of a white colour, not very fetid, is difcharged; when the fever and thirft prefently ceafe, the appetite returns, and fæces of a good confiftence are difcharged, the ftrength alfo returning in fome degree; there is then hope of a perfect recovery. If the matter be not dried up in feven weeks time, the difeafe readily changes to a fiftulous ulcer, which is very difficult to cure. An empyema affecting both fides of the thorax is more dangerous than that which affects only one.

Cure. This confifts in evacuating the purulent matter contained in the cavity of the thorax, which is beft done by the operation of paracentefis. See the article Surgery. Afterwards the ulcer is to be treated with abftergent and confolidating medicines, and the fame internal ones are to be given as in a Phthisis.

Gen. XIII. CARDITIS. 188

Inflammation of the Heart.

Carditis, *Sauv.* gen. 111. *Vog.* 54.
Pericarditis, *Vog.* 53.
Carditis fpontanea, *Sauv.* fp. 1. *Senac.* Traité de Cœur, lib. iv. chap. 7. *Meckel*, Mem. de Berlin, 1756.
Eryfipelas pulmonis, *Lomm.* Obferv. lib. ii.

Defcription. This difeafe is attended with all the fymptoms of pneumonia, but in a higher degree; it is befides faid to be accompanied with hydrophobic fymptoms, fainting, palpitation of the heart, a feeming madnefs, a funk and irregular pulfe, watery eyes, and a dejected countenance, with a dry and black tongue. On diffection, the heart and pericardium are found very much inflamed, and even ulcerated, with many polypous concretions.

Caufes, &c. The fame as in the pneumonia.

Prognofis. In the carditis the prognofis is more unfavourable than in the pneumonia; and indeed, unlefs the difeafe very quickly terminates, it muft prove fatal, on account of the conftant and violent motion of the heart, which exafperates the inflammation, and increafes all the fymptoms.

Cure. Here bleeding is neceffary in as great a

Phlegmasiæ degree as the patient can possibly bear, together with blistering, and the antiphlogistic regimen likewise carried to a greater height than in the pneumonia; but the general method is the same as in other inflammatory diseases.

189 Genus XIV. PERITONITIS.
Inflammation of the PERITONÆUM.

Sp. I. *Inflammation of the* PERITONÆUM properly so called.

Peritonitis, *Vog.* 62. *Lieutaud.* Hist. anat. med. lib. i. obs. 3. *Raygerus* apud eund. lib. i. obs. 341. *Morgagn.* de sed. LVII. 20.

190 Sp. II. *Inflammation of the* PERITONÆUM extended over the *Omentum*.

Epiploitis, *Sauv.* gen. 106. *Sag.* gen. 308.
Omentitis, *Vog.* 61.
Omenti inflammatio, *Boerh.* 958. et Ill. *Van Swieten*, Comm. *Stork.* An. Med. I. 132. *Hulme* on the puerperal fever.

191 Sp. III. *Inflammation of the* PERITONÆUM stretched over the *Mesentery*.

Mesenteritis, *Vog.* 60.
Enteritis mesenterica, *Sauv.* sp 4.

192 Genus XV. GASTRITIS.
Inflammation of the STOMACH.

193 A. *GASTRITIS PHLEGMONODÆA*, or the *genuine Gastritis*.

Gastritis legitima, *Sauv.* sp. 1. *Eller.* de cogn. et cur. morb. sect. xii. *Haller.* obs. 14. hist. 3. *Lieut.* Hist. anat. Med. lib i. 74.
Gastritis erysipelatosa, *Sauv.* sp. 4.
Cardialgia inflammatoria, *Sauv.* sp. 13. *Tralles*, de opio, sect. ii p. 231.

THESE diseases Dr Cullen has thought proper to consider all under the general head of GASTRITIS, as there are no certain signs by which they can be distinguished from each other, and the method of cure must be the same in all.

Description. The inflammation of the stomach is attended with great heat and pain in the epigastric region, extreme anxiety, an almost continual and painful hiccough, with a most painful vomiting of every thing taken into the stomach. Sometimes a temporary madness ensues; and there is an instance in the Edinburgh Medical Essays of the disorder being attended with an hydrophobia. The pulse is generally more sunk than in other inflammations, and the fever inclines to the nature of a typhus. The disorder is commonly of the remitting kind, and during the remissions the pulse frequently intermits. During the height of the disease, a mortal phrenzy frequently supervenes. The disease terminates on the fourth, seventh, ninth day, or from the eleventh to the fifteenth; and is more apt to end in a gangrene than pneumonic inflammations, and more frequently in a scirrhus than in an abscess.

Causes, &c. The inflammation of the stomach may arise from any acrid substance taken into it; from a vehement passion; too large draughts of cold liquor, especially when the person is very hot; from a surfeit; a stoppage of perspiration; repulsion of the gout; inflammations of the neighbouring viscera; or from external injuries, such as wounds, contusions, &c.— It affects chiefly those of a plethoric habit and hot bilious constitution. Gastritis

Prognosis. This disease is always very dangerous, and the prognosis doubtful, which also must always be in proportion to the severity of the symptoms. A cessation of pain, coldness about the præcordia, great debility, with a languid and intermitting pulse, with an abatement of the hiccough, denote a gangrene and speedy death. From the sensibility of the stomach also, and its great connection with the rest of the system, it must be obvious, that an inflammation of it, by whatever causes produced, may be attended with fatal consequences; particularly, by the great debility it produces, it may prove suddenly fatal, without running through the usual course of inflammations.—Its tendency to admit of resolution may be known by its having arisen from no violent cause, by the moderate state of the symptoms, and by a gradual remission of these symptoms in the course of the first or at most of the second week of the disease. The tendency to gangrene may be suspected from the symptoms continuing with unremitting violence notwithstanding the use of proper remedies, and a gangrene already begun may be known by the symptoms above-mentioned, particularly great debility and sudden cessation of pain. The tendency to suppuration may be known by the symptoms continuing but in a moderate degree for more than one or two weeks, and by a considerable remission of the pain while a sense of weight and anxiety still remain. When an abscess has been formed, the frequency of the pulse is first abated: but soon after it increases, with frequent cold shivering, and an exacerbation in the afternoon and evening; followed by night-sweats, and other symptoms of hectic fever. These at length prove fatal, unless the abscess open into the cavity of the stomach, the pus be evacuated by vomiting, and the ulcer soon healed.

Cure. It appears from dissections, that the stomach may very often be inflamed when the characteristic marks of it have not appeared; and therefore we are often exposed to much uncertainty in the cure. But when we have sufficient evidence that a state of active inflammation has taken place in the stomach, the principal object to be aimed at is to obtain a resolution. Before, however, this can be accomplished, it will often be necessary to employ measures with the view of obviating urgent symptoms. When the symptoms appear in the manner above described, the cure is to be attempted by large and repeated bleedings employed early in the disease; and from these we are not to be deterred by the weakness of the pulse, for it will commonly become fuller and softer after the operation. A blister ought also to be applied to the region of the stomach; and the cure will be assisted by fomentations of the whole abdomen, and by frequent emollient and laxative glysters. The irritability of the stomach in this disease will admit of no medicines being thrown into it; and if any can be supposed necessary, they must be exhibited in glysters. Diluting drinks may be tried; but they must be of the very mildest kind, and given in very small quantities at a time. Opiates, in whatever manner exhibited, cannot be retained in the stomach during the first days of the disease; but when the violence of the disease shall have abated, and when the pain and

vomiting

Phlegmasiæ vomiting recur at intervals only, opiates given in glysters may frequently be employed with advantage; and after bleeding and blisters no remedy is more effectual either in allaying the pain or vomiting. As soon as the stomach will retain any laxative, gentle refrigerant cathartics, taken by the mouth, such as the soda phosphorata, soda tartarisata, or the like, are productive of great benefit. A tendency to gangrene in this disease is to be obviated only by the means just now mentioned; and when it does actually supervene, it admits of no remedy. A tendency to suppuration is to be obviated by the same means employed early in the disease. After a certain period it cannot be prevented by any means whatever; and, when actually begun, must be left to nature; the only thing that can be done by art being to avoid all irritation.

194 B. *Gastritis Erysipelatosa*, or the *Erysipelatous Gastritis.*

Description. This species of inflammation takes place in the stomach much more frequently than the former. From dissections it appears that the stomach has been often affected with inflammation, when neither pain nor fever had given any notice of it; and such is justly looked upon to have been of the erysipelatous kind. This kind of inflammation also is especially to be expected from acrimony of any kind applied to the stomach; and would certainly occur much more frequently, were not the interior surface of this organ commonly defended by mucus exsuding in large quantity from the numerous follicles placed immediately under the villous coat. On many occasions, however, the exsudation of mucus is prevented, or the liquid poured out is of a less viscid kind, so as to be less fitted to defend the subjacent nerves; and it is in such cases that acrid matters may readily produce an erysipelatous affection of the stomach.

In many cases, however, this kind of inflammation cannot be discovered, as it takes place without pain, pyrexia, or vomiting: but in some cases it may; namely, when it spreads into the œsophagus, and appears on the pharynx and on the whole internal surface of the mouth. When therefore an erysipelatous inflammation affects the mouth and fauces, and there shall be at the same time in the stomach an unusual sensibility to all acrids, and also a frequent vomiting, there can be little doubt of the stomach's being affected in the same manner. Even when no inflammation appears in the fauces, if some degree of pain be felt in the stomach, if there be a want of appetite, an anxiety and frequent vomiting, an unusual sensibility with regard to acrids, some thirst, and frequency of pulse, there will then be room to suspect an inflammation in the stomach; and such symptoms, after some time, have been known to discover their cause by the inflammation rising to the fauces or mouth. Inflammation of this kind is often disposed to pass from one place to another on the same surface, and, in doing so, to leave the place it had at first occupied. Such an inflammation has been known to spread successively along the whole tract of the alimentary canal; occasioning, when in the intestines, diarrhœa, and in the stomach vomitings; the diarrhœa ceasing when the vomitings came on, and the vomitings on the coming on of the diarrhœa.

Causes, &c. An erysipelatous inflammation may arise from acrid matters taken into the stomach; or from some internal causes not yet well known. It frequently occurs in putrid diseases, and in those recovering from fevers.

Cure. When the disease is occasioned by acrid matters taken internally, and these may be supposed still present in the stomach, they are to be washed out by drinking a large quantity of warm and mild medicines, and exciting vomiting. At the same time, if the nature of the acrimony and its proper corrector be known, this should be thrown in; or if a specific corrector be not known, some general demulcents should be employed.

These measures, however, are more suited to prevent than to cure inflammation after it has taken place. When this last may be supposed to have happenpened, if it be attended with a sense of heat, with pain and pyrexia, according to the degree of these symptoms, the measures proposed for the cure of the other kind are to be more or less employed. When an erysipelatous inflammation of the stomach has arisen from internal causes, if pain and pyrexia occur, bleeding may be employed in persons not otherwise weakened; but in case of its occurring in putrid diseases, or where the patients are already debilitated, bleeding is inadmissible; all that can be done being to avoid irritation, and only throwing into the stomach what quantity of acids and acescent aliments it shall be found able to bear. In some conditions of the body in which this disease is apt to occur, the Peruvian bark and bitters may seem to be indicated; but an erysipelatous state of the stomach will seldom allow them to be used.

Genus XVI. ENTERITIS, 195

Inflammation of the *Intestines.*

Enteritis, *Sauv.* gen. 105. *Lin.* 29. *Vog.* 57. *Sag.* gen. 307.
Intestinorum inflammatio, *Boerh.* 959.
Febris intestinorum inflammatoria ex mesenterio, *Hoffm.* II. 170.

Sp. I. *Enteritis Phlegmonodæa*, or the *Acute Enteritis.* 196

Enteritis iliaca, *Sauv.* sp. 1.
Enteritis colica, *Sauv.* sp. 2. *Boerh.* 963.

Description. This disease shows itself by a fixed pain in the abdomen, attended with fever, vomiting, and costiveness. The pain is often felt in different parts of the abdomen, but more frequently spreads over the whole, and is particularly violent about the navel.

Causes, &c. Inflammations of the intestines may arise from the same causes as those of the stomach; though commonly the former will more readily occur from cold applied to the lower extremities, or to the belly itself. It is also found supervening on the spasmodic colic, incarcerated hernia, and volvulus.

Prognosis. Inflammations of the intestines have the same terminations with those of the stomach, and the prognosis in both cases is much the same.

Cure. The cure of enteritis is in general the same with that of gastritis: but in this disease there is commonly more opportunity for the introduction of liquids, of acid, acescent, and other cooling remedies, and even of laxatives; but as a vomiting frequently attends the enteritis, care must be taken not to excite that vomiting by the quantity or quality of any thing thrown

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thrown into the stomach. With regard to the suppuration and gangrene of the intestines following the enteritis, the observations made respecting these terminations of gastritis are equally applicable in this disease.

197 Sp. II. *Enteritis Erysipelatosa*, or *Erysipelatous Enteritis.*

Concerning this nothing farther can be said, than what hath been already delivered concerning the gastritis.

198 Genus XVII. HEPATITIS.
Inflammation of the Liver.

Hepatitis, *Sauv.* gen. 113. *Lin.* 35. *Vog.* 58. *Sag.* gen. 312. *Boerh.* 914. *Hoffm.* II. 14. *Junck.* 65.

Description. The inflammation of the liver is thought to be of two kinds, acute and chronic; but the latter very often does not discover itself except by an abscess found in the liver after death, and which is supposed to have been occasioned by some degree of inflammation; for this reason the chronic inflammation often escapes observation, and we shall here only treat of the acute hepatitis.

The acute hepatitis is attended with considerable fever; a frequent, strong, and hard pulse; high coloured urine; an acute pain in the right hypochondrium, increased by pressing upon the part. The pain is very often in such a part of the side as to make it appear like a pleurisy; and frequently, like that, is increased on inspiration. The disease is also commonly attended with a cough, which is generally dry, but sometimes moist; and when the pain thus resembles a pleurisy, the patient cannot lie easily except upon the side affected. The pain is frequently extended to the clavicle, and to the top of the shoulder; and is attended sometimes with hiccough, and sometimes with vomiting. Some have added jaundice, or a yellowness of the eyes, to the symptoms of this distemper; but experience shows that it has often occurred without any such symptom.

When hepatitis is of the chronic kind, depending more on an accumulation and effusion in the liver, than in an increased action of its small vessels, the patient complains rather of a sense of weight than of pain; and the fever is by no means either acute or constant: but it often returns in paroxysms somewhat resembling the attacks of an intermittent. This disease is very slow in its progress, frequently continuing for many months, and at last terminating in a very considerable suppuration. In most cases, however, it may be discovered by careful examination of the region of the liver externally. By this means, a considerable enlargement of that viscus may in general be discovered.

Causes, &c. The remote causes of hepatitis are not always to be discerned, and many have been assigned on a very uncertain foundation. It has been supposed that the disease may be an affection either of the extremities of the hepatic artery, or those of the vena portarum; and the supposition is by no means improbable. The opinion, however, most commonly adopted is, that the acute hepatitis is an affection of the external membrane of the liver, and the chronic kind an affection of the parenchyma of that viscus. The acute disease may be seated either on the convex or concave surface of the liver; and in the former case a more pungent pain and hiccough may be produced, and the respiration is more considerably affected. In the latter there occurs less pain; and a vomiting is produced, commonly by some inflammation communicated to the stomach. The inflammation on the concave surface of the liver may be readily communicated to the gall-bladder and biliary ducts: and this, perhaps, is the only case of idiopathic hepatitis attended with jaundice.

Hepatitis.

Prognosis. The inflammation of the liver, like others, may end by resolution, suppuration, or gangrene; and the tendency to the one or to the other of those events may be known from what has been already mentioned concerning the prognosis in gastritis. The resolution of hepatitis is often the consequence of, or is attended with, evacuations of different kinds. A hæmorrhage, sometimes from the nose, and sometimes from the hæmorrhoidal vessels, gives a solution of the disease. Sometimes the same thing is accomplished by a bilious diarrhœa; and sometimes the resolution is attended with sweating, and an evacuation of urine depositing a copious sediment. Sometimes it may be cured by an erysipelas appearing in some external part. When the disease has ended in suppuration, the pus collected may be discharged by the biliary ducts; or, if the suppurated part does not adhere any where closely to the neighbouring parts, it may be discharged into the cavity of the abdomen: but if, during the first state of inflammation, the affected part of the liver shall have formed a close adhesion to some of the neighbouring parts, the discharge after suppuration may be various, according to the different seat of the abscess. When seated on the convex part of the liver, if the adhesion be to the peritonæum lining the common teguments, the pus may make its way through these, and be discharged outwardly: or if the adhesion shall have been to the diaphragm, the pus may penetrate through this, and into the cavity of the lungs; from whence it may be discharged by coughing. When the abscess is seated on the concave part of the liver, in consequence of adhesions, the pus may be discharged into the stomach or intestines; and into these last, either directly, or by the intervention of the biliary ducts. Upon a consideration of all these different circumstances therefore, together with the general principles of inflammation, must the prognosis of this disease be established.

Cure. For the cure of hepatitis, we must have recourse to the general means of removing other inflammatory disorders. Bleeding is to be used according to the degree of fever and pain. Blisters are to be applied: fomentations of the external parts, emollient glysters, gentle laxatives, diluents and refrigerants, are also useful. The cure, however, particularly in warm climates, where the disease is much more common than it is in Britain, is chiefly trusted to mercury. Not only in cases of the chronic kind, but in acute hepatitis also, after an attempt has been made to alleviate the urgent symptoms by bleeding and blistering, recourse is immediately had to this powerful mineral. It is employed by different practitioners, and in different cases, under various forms. Some are very

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very fond of the use of calomel. But the preference is in general given, and perhaps with justice, to friction with mercurial ointment over the region of the liver. But under whatever form it may be employed, it is necessary that it should be introduced to such an extent as to keep the patient on the verge of salivation for some length of time; the duration being regulated by the circumstances of the case.

From the liberal use of mercury, there can be no doubt that a successful resolution has been obtained in many cases, which would otherwise have infallibly terminated in suppuration. But notwithstanding the most careful employment of it in some cases, suppuration will ensue; and then it is very doubtful whether any benefit will be derived from the continuance of it. But when a suppuration has been formed, and the abscess points outwardly, the part must be opened, the pus evacuated, and the ulcer healed according to the ordinary methods in use for healing abscesses and ulcers in other parts.

199 Genus XVIII. SPLENITIS.

Inflammation of the Spleen.

Splenitis, *Sauv.* gen. 114. *Lin.* 36. *Vog.* 59. *Junck.* 67. *Sag.* gen. 313.

Lienis inflammatio, *Boerh.* 958. & *Van Swieten.* Comm.

Splenitis phlegmonodæa, *Sauv.* sp. 1. *Forest*, l. xx. obs. 6. *De Haen*, apud *Van Swieten*, p. 958.

Pleuritis splenica, *Sauv.* sp. 19.

Splenalgia suppuratoria, *Sauv.* sp. 3.

Description. This disease, according to *Juncker*, comes on with a remarkable shivering succeeded by a most intense heat and very great thirst; a pain and tumor are perceived in the left hypochondrium, and the paroxysms for the most part assume a quartan form. When the patients expose themselves for a little to the free air, their extremities immediately grow very cold. If an hæmorrhagy happens, the blood flows out of the left nostril. The other symptoms are the same with those of the hepatitis. Like the liver, the spleen often is also subject to a chronic inflammation, which often happens after agues, and is called the *ague cake*, though that name is also frequently given to a scirrhous tumor of the liver succeeding intermittents.

Causes, &c. The causes of this distemper are in general the same with those of other inflammatory disorders; but those which determine the inflammation to that particular part more than another, are very much unknown. It attacks persons of a very plethoric and sanguine habit of body rather than others.

Prognosis. What has been said of the inflammation of the liver applies also to that of the spleen, tho' the latter is less dangerous than the former. Here also a vomiting of black matter, which in other acute diseases is such a fatal omen, sometimes proves critical, according to the testimony of Juncker. Sometimes the hæmorrhoids prove critical; but very often the inflammation terminates by scirrhus.

Cure. This is not at all different from what has been already laid down concerning the hepatitis.

200 Genus XIX. NEPHRITIS.

Inflammation of the Kidneys.

Nephritis, *Sauv.* gen. 115. *Lin.* 37. *Vog.* 65. *Sag.* gen. 314.

Nephritis vera, *Sauv.* sp. 1.

Nephritis.

Description. The nephritis has the same symptoms in common with other inflammations; but its distinguishing mark is the pain in the region of the kidney, which is sometimes obtuse, but more frequently pungent. The pain is not increased by the motion of the trunk of the body so much as a pain of the rheumatic kind affecting the same region. It may also frequently be distinguished by its shooting along the course of the ureter, and it is often attended with a drawing up of the testicle, and a numbness of the limb on the side affected; though indeed these symptoms most commonly attend the inflammation arising from a calculus in the kidney or ureter. The disease is also attended with frequent vomiting, and often with costiveness and colic pains. The urine is most commonly of a deep red colour, and is voided frequently and in a small quantity at a time. In more violent cases the urine is commonly colourless.

Causes, &c. The remote causes of this disease may be various; as external contusion, violent or long-continued riding; strains of the muscles of the back incumbent on the kidneys; various acrids in the course of circulation conveyed to the kidneys; and perhaps some other internal causes not yet well known: the most frequent is that of calculous matter obstructing the *tubuli uriniferi*, or calculi formed in the pelvis of the kidneys, and either sticking there or falling into the ureter.

Prognosis. This is not different from that of other inflammatory diseases.

Cure. When any of those causes operating as inducing the inflammation still continue to act, the first object in the cure must be the removal of these: but the principal intention to be had in view, is the resolution of the inflammation which has already taken place. But when, notwithstanding efforts for this purpose, the disease terminates in suppuration, it must be the endeavour of the practitioner to promote the discharge of purulent matter, and the healing of the ulceration in the kidney.

These different objects are principally accomplished by bleeding, external fomentation, frequent emollient glysters, antiphlogistic purgatives, and by the free use of mild and demulcent liquids. The use of blisters is scarce admissible, or at least will require great care to avoid any considerable absorption of the cantharides.

The other species of nephritis enumerated by authors are only symptomatic.

Genus XX. CYSTITIS. 201

Inflammation of the Bladder.

Cystitis, *Sauv.* gen. 108. *Lin.* 31. *Vog.* 66. *Sag.* gen. 309.

Inflammatio vesicæ, *Hoffm.* II. 157.

The Cystitis from *Internal Causes*. 202

Cystitis spontanea, *Sauv.* sp. 1.

The Cystitis from *External Causes*. 203

Cystitis a cantharidibus, *Sauv.* sp. 2.

Cystitis traumatica, *Sauv.* sp. 3.

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The inflammation of the bladder from internal causes is a very rare distemper; and when it does at any time occur, is to be cured in the same manner with other inflammations, avoiding only the use of cantharides. When the disease arises from the internal use of these flies, camphor is recommended, besides other cooling medicines, and particularly cooling and emollient glysters.

Genus XXI. HYSTERITIS.

204 *Inflammation* of the UTERUS.

Hysteritis, *Lin.* 38. *Vog.* 63.
Metritis, *Sauv.* gen. 107. *Sag.* gen. 315.
Inflammatio et febris uterina, *Hoffm* II. 156.

Description. This disease is often confounded with that called the *puerperal* or *child-bed fever*; but is essentially distinct from it, as will be shown in its proper place. The inflammation of the uterus is often apt to terminate by gangrene: there is a pain in the head, with delirium; and the uterine region is so exceedingly tender, that it cannot bear the most gentle pressure without intolerable pain. When the *fundus uteri* is inflamed, there is great heat, throbbing, and pain, above the pubes; if its posterior part, the pain is more confined to the loins and rectum, with a tenesmus; if its anterior part, it shoots from thence towards the neck of the bladder, and is attended with a frequent irritation to make water, which is voided with difficulty; and if its sides or the ovaria are affected, the pains will then dart into the inside of the thighs.

Causes, &c. Inflammations of the uterus, and indeed of the rest of the abdominal viscera, are very apt to take place in child-bed women; the reason of which seems to be the sudden change produced in the habit, and an alteration in the course of the circulating blood by the contraction of the uterus after delivery. The pressure of the gravid uterus being suddenly taken off from the *aorta descendens* after delivery, the resistance to the impulse of the blood passing through all the vessels derived from it, and distributed to the contiguous viscera, will be considerably lessened: it will therefore rush into those vessels with a force superior to their resistance; and, by putting them violently on the stretch, may occasion pain, inflammation, and fever. This contraction of the uterus also renders its vessels impervious to the blood which had freely passed through them for the service of the child during pregnancy; and consequently a much larger quantity will be thrown upon the contiguous parts, which will still add to their distension, and increase their tendency to inflammation.

Prognosis. An inflammation of the uterus generally may be expected to produce an obstruction of the lochia; but the fever produced seldom proves fatal, unless the inflammation be violent, and end in a gangrene.

Cure. This is to be attempted by the same general means already recommended, and the management of this disorder entirely coincides with that of the puerperal fever.

Genus XXII. RHEUMATISMUS.

205 The RHEUMATISM.

Rheumatismus, *Sauv.* gen. 185. *Lin.* 62. *Vog.* 138. *Boerh.* 1400. *Junck.* 19.

N° 205.

Rheumatismus.

Dolores rheumatici et arthritici, *Hoffm.* II. 317.
Myositis, *Sag.* gen. 301.

The *Acute* RHEUMATISM.

Rheumatismus acutus, *Sauv.* sp. 1.
Rheumatismus vulgaris, *Sauv.* sp. 2.

A. The LUMBAGO, or *Rheumatism in the muscles of the Loins.* 206

Lumbago rheumatica, *Sauv.* gen. 212. *Sag.* p. 1.
Nephralgia rheumatica, *Sauv.* sp. 4.

B. The SCIATICA, *Ischias*, or *Hip-Gout.* 207

Ischias rheumaticum, *Sauv.* 213. sp. 10.

C. The *Bastard* PLEURISY, or *Rheumatism in the muscles of the Thorax.* 208

Pleurodyne rheumatica, *Sauv.* gen. 148. sp. 3.
Pleuritis spuria, *Boerh.* 878.

The other species, which are very numerous, are all symptomatic; as,
Lumbago plethorica, *Sauv.* sp. 3.
Ischias sanguineum, *Sauv.* sp. 2.
Pleurodyne plethorica, *Sauv.* sp. 1.
Rheumatismus hystericus, *Sauv.* sp. 7.
Ischias hystericum, *Sauv* sp. 3.
Pleurodyne hysterica, *Sauv.* sp. 6.
Rheumatismus saltatorius, *Sauv.* sp. 8.
Pleurodyne flatulenta, *Sauv.* sp. 4.
Pleurodyne a spasmate, *Sauv.* sp. 9.
Rheumatismus scorbuticus, *Sauv.* sp. 4.
Lumbago scorbutica, *Sauv.* sp. 5.
Pleurodyne scorbutica, *Sauv.* sp. 11.
Ischias syphiliticum, *Sauv.* sp. 7.
Pleurodyne venerea, *Sauv.* sp. 5.
Lumbago sympathica, *Sauv.* sp. 13.
a mesenterii glandulis induratis
a pancreate tumido, purulento, scirrhoso, putri,
ab induratis pyloro, vena cava, pancreate
a rene scirrhoso, putrefacto
ab abscessu circa venæ cavæ bifurcationem
a vermibus intra renes.
Lumbago a saburra, *Sauv.* sp. 8.
Pleurodyne a cacochylia, *Sauv.* sp. 7.
Rheumatismus saltatorius verminosus, *Sauv.* sp. 8.
Ischias verminosum, *Sauv.* sp. 8.
Pleurodyne verminosa, *Sauv.* sp. 2.
Rheumatismus metallicus, *Sauv.* sp. 10.
Lumbago a hydrothorace, *Sauv.* sp. 14.
Lumbago pseudoischuria, *Sauv.* sp. 16.
Pleurodyne a rupto œsophago, *Sauv.* sp. 20.
Pleurodyne rachitica, *Sauv.* sp. 13.
Ischias a sparganosi, *Sauv.* sp. 5.
Pleurodyne catarrhalis, *Sauv.* sp. 14.
Rheumatismus necroseos, *Sauv.* sp. 14.
Rheumatismus dorsalis, *Sauv.* sp. 11.
Lumbago a satyriasi, *Sauv.* sp. 15.
Rheumatismus febricosus, *Sauv.* sp. 9.
Lumbago febrilis, *Sauv.* sp. 4.
&c. &c.

Description. The rheumatism is particularly distinguished by pains affecting the joints, and for the most part the joints alone; but sometimes also the muscular parts. Very often they shoot along the course of the muscles

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A joint, after having been for some time affected with pain, commonly becomes also affected with some swelling and redness, which is painful to the touch. It seldom happens that a swelling coming on does not take off the pain entirely, or secure the joint against a return of it. This disease is commonly attended with more or less sweating, which occurs early, but is seldom free or copious, and seldom either relieves from the pains or proves critical. The urine is high coloured, and in the beginning without sediment. This, however, does not prove entirely critical, for the disease often continues long after such a sediment has appeared in the urine. The blood is always sizy. The acute rheumatism differs from all other inflammatory diseases, in not being liable to terminate in suppuration: this almost never happens; but the disease sometimes produces effusions of a transparent gelatinous fluid into the sheathes of the tendons: but if these effusions be frequent, it is certain that the liquor must very frequently be absorbed; for it very seldom happens, that considerable or permanent tumors have been produced, or such as required to be opened and to have the contained fluid evacuated. Such tumors, however, have sometimes occurred, and the opening made in them has produced ulcers very difficult to heal.

Sometimes the rheumatism will continue for several weeks; but it seldom proves fatal, and it is rare that the pyrexia continues to be considerable for more than two or three weeks. While the pyrexia abates in its violence, if the pains of the joints continue, they are less violent; more limited in their place, being confined commonly to one or a few joints only; and are less ready to change their place. Rheumatismus.

It is often a very difficult matter to distinguish rheumatism from gout: but in rheumatism there in general occurs much less affection of the stomach; it affects chiefly the larger joints, and several of these are often affected with severe pain at the same time: it occurs at an earlier period of life than gout; it is not observed to be hereditary; and it can in general be traced to some obvious exciting cause, particularly to the action of cold.

Causes, &c. This disease is frequent in cold, and more uncommon in warm, climates. It appears most frequently in autumn and spring; less frequently in winter, while the frost is constant; and very seldom during the heat of summer. It may, however, occur at any season, if vicissitudes of heat and cold be for the time frequent. For the most part, the acute rheumatism arises from the application of cold to the body when unusually warm; or when the cold is applied to one part of the body, whilst the other parts are kept warm; or lastly, when the application of the cold is long continued, as when moist or wet clothes are applied to any part of the body.—These causes may affect persons of all ages; but the rheumatism seldom appears either in very young or in elderly persons, and most commonly occurs from the age of puberty to that of 35. These causes may also affect persons of any constitution, but they most commonly affect those of a sanguine temperament.

With respect to the proximate cause of rheumatism, there have been various opinions. It has been imputed to a peculiar acrimony; of which, however, there is no evidence; and the consideration of the remote causes, the symptoms, and cure, render it very improbable. A disease of a rheumatic nature, however, may be occasioned by an acrid matter applied to the nerves, as is evident from the tooth-ach, a rheumatic affection generally arising from a carious tooth. Pains arising from deep-seated suppurations may also resemble the rheumatism; and many cases have occurred in which such suppurations occasioned pains resembling the lumbago and ischias; but from what hath been already said, it seems improbable that ever any rheumatic case should end in suppuration.

The proximate cause of rheumatism hath by many been supposed to be a lentor in the fluids obstructing the vessels of the part; but in the former part of this treatise, sufficient reasons have been already laid down for rejecting the doctrine of lentor. While we cannot therefore find either evidence or reason for supposing that the rheumatism depends on any change in the state of the fluids, we must conclude that the proximate cause of it is the same with that of other inflammations not depending upon a direct stimulus.

In the case of rheumatism, it is supposed that the most common remote cause of it, that is, cold applied, operates especially on the vessels of the joints, these being less covered by a cellular texture than those of the intermediate parts of the limbs. It is farther supposed, that the application of cold produces a constriction of the extreme vessels, and at the same time an increase of tone or phlogistic diathesis in the course of them, from which arises an increased impetus of the

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the blood, and at the same time a resistance to the free passage of it, and consequently inflammation and pain. It is also supposed, that the resistance formed, excites the *vis medicatrix* to a further increase of the impetus of the blood; and to support this, a cold stage arises, a spasm is formed, and a pyrexia and phlogistic diathesis are produced in the whole system.

Hence the cause of rheumatism appears to be exactly analogous to that of inflammations depending on an increased afflux of blood to a part while it is exposed to the action of cold. But there seems to be further in this disease some peculiar affection of the muscular fibres. These seem to be under some degree of rigidity; and therefore less easily admit of motion, and are pained upon the exertions of it. This also seems to be the affection which gives opportunity to the propagation of pains from one joint to another, and which are most severely felt in the extremities terminating in the joints, because beyond these the oscillations are not propagated. This affection of the muscular fibres explains the manner in which strains and spasms produce rheumatic affections; and, on the whole, shows, that with an inflammatory affection of the sanguiferous system, there is also in rheumatism a peculiar affection of the muscular fibres, which has a considerable share in producing the phenomena of the disease. And it would even appear, that in what has commonly been called *acute rheumatism*, in contradistinction to the chronic, of which we are next to treat, there exists not only a state of active inflammation in the affected parts, but also of peculiar irritability; and that this often remains after the inflammation is very much diminished or has even entirely ceased. Hence a renewal of the inflammation and recurrence of the pain take place from very slight causes; and in the treatment of the disease both the state of inflammation and irritability must be had in view.

Cure. For counteracting the state of active inflammation, the chief aim of the practitioner must be to diminish the general impetus of the circulation, and the impetus at the part particularly affected. For counteracting the state of irritability, he must endeavour to remove the disposition to encreased action in the vessels; to prevent the action of causes exciting painful sensations; and to obviate their influence on the part. The cure therefore requires, in the first place, an antiphlogistic regimen, and particularly a total abstinence from animal-food, and from all fermented or spirituous liquors; substituting a mild vegetable or milk diet, and the plentiful use of soft diluting liquors. On this principle also, blood-letting is the chief remedy of acute rheumatism. The blood is to be drawn in large quantity; and the bleeding is to be repeated in proportion to the frequency, fulness, and hardness of the pulse, and the violence of the pain. For the most part, large and repeated bleedings during the first days of the disease seem to be necessary, and accordingly have been very much employed: but to this some bounds are to be set; for very profuse bleedings occasion a slow recovery, and if not absolutely effectual, are ready to produce a chronic rheumatism.

To avoid that debility of the system which general bleedings are apt to occasion, the urgent symptom of pain may be often relieved by topical bleedings; and when any swelling or redness have come upon a joint, the pain may very certainly be relieved by topical bleedings: but as the pain and continuance of the disease seem to depend more upon the phlogistic diathesis of the whole system than upon the affection of particular parts, so topical bleedings will not supply the place of the general bleedings proposed above.

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To take off the phlogistic diathesis prevailing in this disease, purging may be useful, if procured by medicines which do not stimulate the whole system, as neutral salts, and other medicines which have a refrigerant power. Purging, however, is not so useful as bleeding in removing the phlogistic diathesis; and when the disease has become general and violent, frequent stools are inconvenient, and even hurtful, by the motion and pain which they occasion.

Next to blood-letting, nothing is of so much service, both in alleviating the pains in this disease and in removing the phlogistic diathesis, as the use of sudorifics: and of all the medicines belonging to this class, what has commonly been known by the name of Dover's powder, a combination of powder of ipecacuan and opium, is the most convenient and the most effectual. Copious sweating, excited by this medicine, and supported for 10 or 12 hours by tepid diluents, such as decoction of the woods, or the like, will in most instances produce a complete remission of the pain: and by this practice, combined with blood-letting and proper regimen, the disease may often be entirely removed.

If, however, after complete intermissions from pain for some length of time have been obtained by these means, it be found that there is a great tendency to a return of the pains without any obvious cause, recourse may be had with very great benefit to the use of the Peruvian bark. By the early use of this, where a complete intermission from pain is obtained, the necessity of repeated blood-letting and sweating is often superseded; but where a complete remission cannot be obtained, it has been suspected by some to be hurtful: and in these cases, when blood-letting and sudorifics have been pushed as far as may be thought prudent without being productive of the desired effect, very great benefit is often obtained from the use of calomel combined with opium, as recommended in the Edinburgh Medical Commentaries by Dr Hamilton of Lynn-Regis.

In this disease, external applications are of little service. Fomentations in the beginning of the disease rather aggravate than relieve the pains. The rubefacients and camphire are more effectual: but they commonly only shift them from one part to another, and do not prove any cure of the general affection. Blistering may also be very effectual in removing the pain from a particular part; but will be of little use, except where the pains are much confined to one place.

ARTHRODYNIA, or *Chronic Rheumatism*. 209
Rheumatismus chronicus Auctorum.

Description. When the pyrexia attending the acute rheumatism has ceased; when the swelling and redness of the joints are entirely gone, but pains still continue to affect certain joints, which remain stiff, feel uneasy upon

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upon motion, changes of weather, or in the night-time only, the disease is then called the *chronic rheumatism*, as it often continues for a very long time.

The limits between the acute and chronic rheumatisms are not always exactly marked. When the pains are still ready to shift their place; when they are especially severe in the night-time; when, at the same time, they are attended with some degree of pyrexia, and with some swelling, and especially some redness, of the joints; the disease is to be considered as partaking of the nature of the acute rheumatism. But when there is no longer any degree of pyrexia remaining; when the pained joints are without redness; when they are cold and stiff; when they cannot easily be made to sweat; or when, while a free and warm sweat is brought out on the rest of the body, it is only clammy and cold on the pained joints; and when, further, the pains of these are increased by cold, and relieved by heat, applied to them; the case is to be considered as that of a purely chronic rheumatism: or perhaps more properly the first of the conditions now described may be termed the state of irritability, and the second the state of atony.

The chronic rheumatism, or rather the atonic, may affect different joints; but is especially apt to affect those which are surrounded with many muscles, and those of which the muscles are employed in the most constant and vigorous exertions. Such is the case of the vertebræ of the loins, the affection of which is named *lumbago;* or of the hip-joint, when the disease is named *ischias* or *sciatica*.

Violent strains and spasms occurring on sudden and somewhat violent exertions, bring on rheumatic affections, which at first partake of the acute, but very soon change into the nature of the chronic, rheumatism.—Such are frequently the lumbago, and other affections, which seem to be more seated in the muscles than in the joints. The distinction of the rheumatic pains from those resembling them which occur in the siphylis and scurvy must be obvious, either from the seat of the pains, or from the concomitant symptoms peculiar to those diseases. The distinction of the rheumatism from the gout will be more fully understood from what is laid down under the genus Podagra.

Causes, &c. The phenomena of the purely chronic rheumatism lead us to conclude, that its proximate cause is an atony both of the blood-vessels and of the muscular fibres of the part affected, together with such a degree of rigidity and contraction in the latter as frequently attend them in a state of atony: and indeed this atony, carried to a certain extent, gives rise to a state of paralysis, with an almost total loss of motion in the affected limbs. The paralytic state of rheumatism therefore may be pointed out as a fourth condition of the disease, often claiming the attention of the practitioner.

Cure. From the view just now given of the proximate cause of chronic rheumatism, the chief indication of cure must be, to restore the activity and vigour of the part, which is principally to be done by increasing the tone of the moving fibres, but which may sometimes also be aided by giving condensation to the simple solid. When, however, the disease has degenerated into the state of paralysis, the objects to be aimed at are, the restoration of a due condition to the nervous energy in the part affected; the obtaining free circulation of blood through the vessels of the part; and the removal of rigidity in membranes and ligaments.

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For answering these purposes, a great variety of remedies, both external and internal, are had recourse to. The chief of the external are, the supporting the heat of the part, by keeping it constantly covered with flannel; the increasing the heat of the part by external heat, applied either in a dry or humid form; the diligent use of the flesh-brush, or other means of friction; the application of electricity in sparks or shocks; the application of cold water by affusion or immersion; the application of essential oils of the most warm and penetrating kind; the application of salt brine; the employment of the warm bath or of the vapour baths, either to the body in general or to particular parts; and, lastly, the employment either of exercise of the part itself as far as it can easily bear, or by riding or other modes of gestation.

The internal remedies are, Large doses of essential oils drawn from resinous substances, such as turpentine. Substances containing such oils, as guaiac. Volatile alkaline salts. These or other medicines are directed to procure sweat; and calomel, or some other preparation of mercury, in small doses, may be continued for some time. Besides these, there are several others recommended. The cicuta, aconitum, and hyosciamus, have in particular been highly extolled; and an infusion of the rhododendron chrysanthum is said to be employed by the Siberians with very great success. An account of the Siberian mode of practice is given by Dr Matthew Guthrie of Petersburgh, in the fifth volume of the Edinburgh Medical Commentaries, and has been followed with success at other places.

G. XXIV. ODONTALGIA, the Tooth-ach. 213

Odontalgia, *Sauv.* gen. 198. *Lin.* 45. *Vog.* 145. *Sag.* gen. 157. *Junck.* 25.
Odontalgia sive rheumatismus odontalgicus, *Hoffm.* II. 330.
Odontalgia cariosa, *Sauv.* sp. 1.
Odontalgia scorbutica, *Sauv.* sp. 4.
Odontalgia catarrhalis, *Sauv.* sp. 5.
Odontalgia arthritica, *Sauv.* sp. 6.
Odontalgia gravidarum, *Sauv.* sp. 2.
Odontalgia hysterica, *Sauv.* sp. 3.
Odontalgia stomachica, *Sauv.* sp. 9.

Description. This well-known disease makes its attack by a most violent pain in the teeth, most frequently in the *molares*, more rarely in the *incisorii*, reaching sometimes up to the eyes, and sometimes backward into the cavity of the ear. At the same time there is a manifest determination to the head, and a remarkable tension and inflation of the vessels takes place, not only in the parts next to that where the pain is seated, but over the whole head.

Causes, &c. The toothach is sometimes merely a rheumatic affection, arising from cold, but more frequently from a carious tooth. It is also a symptom of pregnancy, and takes place in some nervous disorders; it may attack persons at any time of life, tho' it is most frequent in the young and plethoric.

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Cure. Many empirical remedies have been proposed for the cure of the tooth-ach, but none have in any degree answered the purpose. When the affection is purely rheumatic, blistering behind the ear will almost always remove it; but when it proceeds from a carious tooth, the pain is much more obstinate. In this case it has been recommended to touch the pained part with a hot iron, or with oil of vitriol, in order to destroy the aching nerve; to hold strong spirits in the mouth; to put a drop of oil of cloves into the hollow of the tooth, or a pill of equal parts of opium and camphire: but one of the most useful applications of this kind is strong nitrous acid, diluted with three or four times its weight of spirit of wine, and introduced into the hollow of a tooth from which great pain arises, either by means of an hair pencil or a little cotton. The Peruvian bark has also been recommended, and perhaps with more justice, on account of its tonic and antiseptic powers; but very often all these remedies will fail, and the only infallible cure is to draw the tooth. See Surgery.

211 GENUS XXIV. PODAGRA, the GOUT.

Podagra, *Vog.* 175. *Boerh.* 1254.
Febris podagrica, *Vog.* 69.
Arthritis, *Sauv.* gen. 183. *Lin.* 60. *Vog.* 139. *Sag.* gen. 142.
Dolor podagricus et arthriticus verus, *Hoffm.* II. 339.
Dolores arthritici, *Hoffm.* II. 317.
Affectus spastico-arthritici, *Junck.* 46.

212 Sp. I. The *Regular* GOUT.

Arthritis podagra, *Sauv.* sp. 1.
Arthritis rachialgica, *Sauv.* sp. 11.
Arthritis æstiva, *Sauv.* sp. 4.

213 Sp. II. The *Atonic* GOUT.

Arthritis melancholica, *Sauv.* sp. 6.
Arthritis hiemalis, *Sauv.* sp. 2.
Arthritis chlorotica, *Sauv.* sp. 5.
Arthritis asthmatica, *Sauv.* sp. 9.

214 Sp. III. The *Retrocedent* GOUT.

215 Sp. IV. The *Misplaced* GOUT.

Description. What we call a *paroxysm of the gout* is principally constituted by an inflammatory affection of some of the joints. This sometimes comes on suddenly, without any warning, but is generally preceded by several symptoms; such as the ceasing of a sweating which the feet had been commonly affected with before; an unusual coldness of the feet and legs; a frequent numbness, alternating with a sense of prickling along the whole of the lower extremities; frequent cramps of the muscles of the legs; and an unusual turgescence of the veins.

While these symytoms take place in the lower extremities, the body is affected with some degree of torpor and languor, and the functions of the stomach in particular are more or less disturbed. The appetite is diminished; and flatulency, or other symptoms of indigestion, are felt. These symptoms take place for several days, sometimes for a week or two, before a paroxysm comes on; but commonly, upon the day immediately preceding it, the appetite becomes keener than usual.

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The circumstances of paroxysms are chiefly the following. They come on most commonly in the spring, and sooner or later according as the vernal heat succeeds sooner or later to the winter's cold; and, perhaps, sooner or later also, according as the body may happen to be more or less exposed to vicissitudes of heat and cold.

The attacks are sometimes felt first in the evening, but more commonly about two or three o'clock in the morning. The paroxysm begins with a pain affecting one foot, most commonly in the ball or first joint of the great toe, but sometimes in other parts of the foot. With the attack of this pain, there is commonly more or less of a cold shivering; which, as the pain increases, gradually ceases; and is succeeded by a hot stage of pyrexia, which continues for the same time with the pain itself. From the first attack, the pain becomes, by degrees, more violent, and continues in this state with great restlessness of the whole body till next midnight, after which it gradually remits; and, after it has continued for 24 hours from the commencement of the first attack, it commonly ceases almost entirely; and, with the coming on of a gentle sweat, allows the patient to fall asleep. The patient, upon coming out of this sleep in the morning, finds the pained part affected with some redness and swelling, which, after having continued for some days, gradually abate.

When a paroxysm has thus come on, although the violent pain after 24 hours be considerably abated, the patient is not entirely relieved from it. For some days he has every evening a return of more considerable pain and pyrexia, and these continue with more or less violence till morning. After going on in this manner for several days, the disease sometimes goes entirely off, not to return till after a long interval.

When the disease, after having thus remained for some time in a joint, ceases entirely, it generally leaves the person in very perfect health, enjoying greater ease and alacrity in the functions of both body and mind than he had for a long time before experienced.

At the beginning of the disease, the returns of it are sometimes only once in three or four years: but as it advances, the intervals become shorter, and at length the attacks are annual; afterwards they come twice each year; and at length recur several times during the course of autumn, winter, and spring; and as, when the fits are frequent, the paroxysms become also longer, so, in the advanced state of the disease, the patient is hardly ever tolerably free from it, except perhaps for two or three months in summer.

The progress of the disease is also marked by the parts which it affects. At first, it commonly affects one foot only; afterwards every paroxysm affects both feet, the one after the other; and as the disease proceeds, it not only affects both feet at once, but, after having ceased in the foot which was secondly attacked, returns again into the first, and perhaps a second time also into the other. Its changes of places are not only from one foot to another, but from the feet into other joints, especially those of the upper and lower extremities; so that there is hardly a joint of the body which,

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which, on one occasion or other, is not affected. It sometimes affects two different joints at the very same time; but more commonly it is at any one time severe in a single joint only, and passes in succession from one joint to another; so that the patient's affliction is often protracted for a long time.

When the disease has often returned, and the paroxysms have become very frequent, the pains are commonly less violent than they were at first; but the patient is more affected with sickness, and the other symptoms of the atonic gout, which shall be hereafter mentioned.

After the first paroxysm of the disease, the joints which have been affected are entirely restored to their former suppleness and strength: but after the disease has recurred very often, the joints affected do neither so suddenly nor entirely recover their former state, but continue weak and stiff; and these effects at length proceed to such a degree, that the joints lose their motion entirely.

In many persons, but not in all, after the disease has frequently recurred, concretions of a chalky nature are formed upon the outside of the joints, and for the most part immediately under the skin. The matter seems to be deposited at first in a fluid form, afterwards becoming dry and firm. In their firm state, these concretions are a hard earthy substance, very entirely soluble in acids. After they have been formed, they contribute, with other circumstances, to destroy the motion of the joint.

In most persons who have laboured under the gout for many years, a nephritic affection comes on, and discovers itself by all the symptoms which usually attend calculous concretions in the kidneys, and which we shall have occasion to describe in another place. All that is necessary to be observed here is, that the nephritic affection alternates with paroxysms of the gout; and that the two affections, the nephritic and the gouty, are hardly ever present at the same time. This also may be observed, that children of gouty or nephritic parents commonly inherit one or other of these diseases; but whether the principal disease of the parent may have been either gout or nephritis alone, some of the children have the one and some the other. In some of them, the nephritic affection occurs alone, without any gout supervening; and this happens to be frequently the case with the female children of gouty parents.

In the whole of the history already given, we have described the most common form of the disease, and which therefore, however diversified in the progress of it, may be still called the regular state of the gout.—Upon some occasions, however, the disease assumes different appearances: but as we suppose the disease to depend always upon a certain diathesis, or disposition of the system; so every appearance which we can perceive to depend upon that same disposition, we still consider as a symptom and case of the gout. The principal circumstance, in what we term the *regular gout*, is the inflammatory affection of the joints; and whatever symptoms we can perceive to be connected with, or to depend upon, the disposition which produces that inflammatory affection, but without its taking place or being present at the same time, we name the *irregular gout*.

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Of such irregular gout there are three different states, which may be named the *atonic*, the *retrocedent*, and the *misplaced* gout.

The first is, when the gouty diathesis prevails in the system; but, from certain causes, does not produce the inflammatory affection of the joints. In this case, the morbid symptoms which appear, are chiefly affections of the stomach, such as loss of appetite, indigestion, and its various attendants of sickness, nausea, vomiting, flatulency, acid eructations, and pains in the region of the stomach. These symptoms are frequently accompanied with pains and cramps in several parts of the trunk and the upper extremities of the body, which are relieved by the discharge of wind from the stomach. Together with these affections of the stomach, there commonly occurs a costiveness; but sometimes a looseness, with colic pains. These affections of the alimentary canal are often attended with all the symptoms of hypochondriasis, such as dejection of mind, a constant and anxious attention to the slightest feelings, an imaginary aggravation of these, and an apprehension of danger from them.

In the same atonic gout, the viscera of the thorax also are sometimes affected, and palpitations, faintings, and asthma, occur.

In the head also occur headachs, giddiness, apoplectic and paralytic affections.

When the several symptoms now mentioned occur in habits having the marks of a gouty disposition, this may be suspected to have laid the foundation of them; and especially when either, in such habits, a manifest tendency to the inflammatory affection has formerly appeared, or when the symptoms mentioned are intermixed with and are relieved by some degree of the inflammatory gout. In such cases there can be no doubt of considering the whole as a state of the gout.

Another state of the disease we name the *retrocedent* gout. This occurs when an inflammatory state of the joints has, in the usual manner, come on, but without arising to the ordinary degree of pain and inflammation; or at least without these continuing for the usual time, or without their receding gradually in the usual manner; these affections of the joints suddenly and entirely cease, while some internal part becomes affected. The internal part most commonly attacked is the stomach; which then is affected with anxiety, sickness, vomiting, or violent pain: but sometimes the internal part is the heart, which gives occasion to a syncope; sometimes it is the lungs, which are affected with asthma; and sometimes it is the head, giving occasion to apoplexy or palsy. In all these cases there can be no doubt that the symptoms are all a part of the same disease, however different the affection may seem to be in the parts which it attacks.

The third state of irregular gout, which we name the *misplaced*, is when the gouty diathesis, instead of producing the inflammatory affection of the joints, produces an inflammatory affection of some internal part, and which appears from the same symptoms that attend the inflammations of those parts arising from other causes.

Whether the gouty diathesis does ever produce such inflammation of the internal parts without having first produced it in the joints, or whether the inflammation of

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of the internal part be always a translation from the joints previously affected, we dare not determine; but, even supposing the latter to be always the case, we think the difference of the affection of the internal part must still distinguish the *misplaced* from what we have named the *retrocedent gout*.

With regard to the misplaced gout, Dr Cullen, whom we here follow, tells us, that he never met with any cases of it in his practice, nor does he find any distinctly marked by practical writers, except that of a pneumonic inflammation.

There are two cases of a translated gout; the one of which is an affection of the neck of the bladder, producing pain, strangury, and a *catarrhus vesicæ*: the other is an affection of the rectum, sometimes indicated by pain alone in that part, and sometimes by hæmhorrhoidal symptoms. In gouty persons such affections have been known to alternate with inflammatory affections of the joints; but whether these belong to the retrocedent or to the misplaced gout, our author pretends not to determine.

It is commonly supposed, that there are some cases of rheumatism which are scarcely to be distinguished from the gout: but these, Dr Cullen thinks, are but few; and that the two diseases may be for the most part distinguished with great certainty, by observing the predisposition, the antecedent circumstances, the parts affected, the recurrences of the disease, and its connection with the system; which circumstances, for the most part, appear very differently in the two diseases.

Causes, &c. The gout is generally an hereditary disease: but some persons, without any hereditary disposition, seem to acquire it; and in some an hereditary disposition may be counteracted from various causes. It attacks the male sex especially; but it sometimes, tho' more rarely, attacks also the female. The females liable to it are those of the more robust and full habits; and it very often happens to those before the menstrual evacuation hath ceased. Dr Cullen hath also found it occurring in several females whose menstrual evacuations were more abundant than usual.

The gout seldom attacks eunuchs; and when it does, seems to fall upon those who happen to be of a robust habit, to lead an indolent life, and to live very full. It attacks especially men of robust and large bodies, who have large heads, are of full and corpulent habits, and whose skins are covered with a thicker *rete mucosum*, which gives a coarser surface. To speak in the style of the ancient physicians, the gout will seldom be found to attack those of a sanguine, or such as are of a purely melancholic temperament; but very readily those of a *cholerico-sanguine* temperament. It is, however, very difficult to treat this matter with precision. The gout seldom attacks persons employed in constant bodily labour, or those who live much upon vegetable aliment. It does not commonly attack men till after the age of 35; and generally not till a still later period. There are indeed instances of the gout appearing more early; but these are few in comparison of the others. When the disease does appear early in life, it seems to be in those who have the hereditary disposition very strong, and to whom the remote causes hereafter mentioned have been applied in a very confiderable degree.

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As the gout is an hereditary disease, and affects men particularly of a certain habit, its remote causes may be considered as predisponent and occasional. The predisponent cause, as far as expressed by external appearances, has been already marked; and physicians have been very confident in assigning the occasional causes: but in a disease depending so much upon a predisposition, the assigning occasional causes must be uncertain; as in the predisposed the occasional causes may not always appear, and in persons not predisposed they may appear without effect; and this uncertainty must particularly affect the case of the gout.

The occasional causes of the disease seem to be of two kinds. First, those which induce a plethoric state of the body. Secondly, those which in plethoric habits, induce a state of debility. Of the first kind are a sedentary, indolent manner of life, and a full diet of animal-food. Of the second kind of occasional causes which induce debility are excess in venery; intemperance in the use of intoxicating liquors; indigestion, produced either by the quantity or quality of the aliments; much application to study or business, night-watching, excessive evacuations; the ceasing of usual labour; a sudden change from a very full to a very spare diet; the large use of acids and acescents; and lastly, cold applied to the lower extremities. The former seem to act by increasing the predisposition; the latter are commonly the exciting causes, both of the first attacks, and of the repetitions of the disease.

With respect to the proximate cause of the gout, it has generally been thought that it depends on a certain morbific matter always present in the body; and that this matter, by certain causes, thrown upon the joints or other parts, produces the several phenomena of the disease.

This doctrine, however ancient and generally received, appears to Dr Cullen to be very doubtful. For,

First, there is no direct evidence of any morbific matter being present in persons disposed to the gout. There are no experiments or observations which show that the blood or other humours of gouty persons are in any respect different from those of others. Previous to attacks of the gout, there appear no marks of any morbid state of the fluids; for the disease generally attacks those persons who have enjoyed the most perfect health, and appear to be in that state when the disease comes on. At a certain period of the disease, a peculiar matter indeed appears in gouty persons; but this, which does not appear in every instance, and which appears only after the disease has subsisted for a long time, seems manifestly to be the effect, not the cause, of the disease. Further, though there be certain acrids which, taken into the body, seem to excite the gout, it is probable that these acrids operate otherwise in exciting the disease, than by affording the material cause of it. In general, therefore, Dr Cullen thinks there is no proof of any morbific matter being the cause of the gout.

Secondly, the suppositions concerning the particular nature of the matter producing the gout, have been so various, and so contradictory, as to allow us to conclude, that there is truly no proof of the existence of

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of any of them. With respect to many of these suppositions, they are so inconsistent with chemical philosophy, and with the laws of the animal œconomy, that they must be entirely rejected

Thirdly, the supposition of a morbific matter as the cause, is not consistent with the phenomena of the disease, particularly with its frequent and sudden translations from one part to another.

Fourthly, the supposition is further rendered improbable by this, that, if a morbific matter did exist, its operation should be similar in the several parts which it attacks: whereas it seems to be very different, being stimulant, and exciting inflammation, in the joints; but sedative and destroying the tone in the stomach: which, upon the supposition of the same particular matter acting in both cases, is not to be explained by any difference in the part affected.

Fifthly, Some facts alledged in proof of a morbific matter, are not sufficiently confirmed; such as those which would prove the disease to be contagious. There is, however, no proper evidence of this, the facts given being not only few, but exceptionable, and the negative observations innumerable

Sixthly, Some arguments brought in favour of a morbific matter are founded upon a mistaken explanation. The disease has been supposed to depend upon a morbific matter, because it is hereditary. But the inference is not just: for most hereditary diseases do not depend upon any morbific matter, but upon a particular conformation of the structure of the body transmitted from the parent to the offspring; and this last appears to be particularly the case in the gout. It may be also observed, that hereditary diseases depending upon a morbific matter, appear always much more early in life than the gout commonly does.

Seventhly, The supposition of a morbific matter being the cause of the gout, has been hitherto useless, as it has not suggested any successful method of cure. Particular theories of gout have often corrupted the practice, and have frequently led from those views which might have been useful, and from that practice which experience had approved. Further, though the supposition of a morbific matter has been generally received, it has been as generally neglected in practice. When the gout has affected the stomach, nobody thinks of correcting the matter supposed to be present there, but merely of restoring the tone of the moving fibres.

Eighthly, The supposition of a morbific matter is quite superfluous: for it explains nothing, without supposing that matter to produce a change in the state of the moving powers; and a change in the state of the moving powers, produced by other causes, explains every circumstance without the supposition of a morbific matter; and it may be observed, that many of the causes exciting the gout, do not operate upon the state of the fluids, but directly and solely upon that of the moving powers.

Lastly, Dr Cullen contends that the supposition of a morbific matter is superfluous; because, without that, the disease can be explained, he thinks, in a manner more consistent with its phenomena, with the laws of the animal œconomy, and with the method of cure which experience has approved. We now proceed to give this explanation; but, before entering upon it, we must premise some general observations which Dr Cullen states.

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The first observation is, That the gout is a disease of the whole system, or depends upon a certain general conformation and state of the body, which manifestly appears from the facts above mentioned. But the general state of the system depends chiefly upon the state of its primary moving powers; and therefore the gout may be supposed to be an affection of these chiefly.

The second observation is, That the gout is manifestly an affection of the nervous system; in which the primary moving powers of the whole system are lodged. The occasional or exciting causes are almost all such as act directly upon the nerves and nervous system; and the greater part of the symptoms of the atonic or retrocedent gout are manifestly affections of the same system. This leads us to seek for an explanation of the whole of the disease, in the laws of the nervous system, and particularly in the changes which may happen in the balance of its several parts.

The third observation is, That the stomach, which has so universal a consent with the rest of the system, is the internal part that is the most frequently, and often very considerably, affected by the gout. The paroxysms of the disease are commonly preceded by an affection of the stomach; many of the exciting causes act first upon the stomach, and the symptoms of the atonic and retrocedent gout are most commonly and chiefly affections of the same organ. This observation leads us to remark, that there is a balance subsisting between the state of the internal and that of the external parts; and, in particular, that the state of the stomach is connected with that of the external parts, so that the state of tone in the one may be communicated to the other.

These observations being premised, Dr Cullen offers the following pathology of the gout.

In some persons there is a certain vigorous and plethoric state of the system, which at a certain period of life is liable to a loss of tone in the extremities. This is in some measure communicated to the whole system, but appears more especially in the functions of the stomach. When this loss of tone occurs while the energy of the brain still retains its vigour, the *vis medicatrix naturæ* is excited to restore the tone of the parts; and accomplishes it, by exciting an inflammatory affection in some part of the extremities. When this has subsisted for some days, the tone of the extremities and of the whole system is restored, and the patient returns to his ordinary state of health.

This is the course of things in the ordinary form of the disease, which we name the *regular gout;* but there are circumstances of the body, in which this course is interrupted or varied. Thus, when the atony has taken place, if the reaction do not succeed, the atony continues in the stomach, or perhaps in other internal parts; and produces that state which Dr Cullen, for reasons now obvious, named the *atonic gout.*

A second case of variation in the course of the gout is, when to the atony the reaction and inflammation have to a certain degree succeeded, but from causes either internal or external the tone of the extremities and perhaps of the whole system is weakened; so that the inflammatory state, before it had either proceeded to the degree, or continued for the time, requisite for

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restoring

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A third case of variation from the ordinary course of the gout, is, when to the atony, usually preceding, an inflammatory reaction fully succeeds, but has its usual determination to the joints by some circumstances prevented; and is therefore directed to some internal part, where it produces an inflammatory affection, and that state of things which we have named the *misplaced gout*.

Though this theory of Dr Cullen's be supported with much ingenuity, yet we may confidently venture to assert, that on this subject he has been less successful in establishing his own opinion, than in combating those of others; and this theory, as well as others formerly proposed, is liable to numerous and unsurmountable objections. According to the hypothesis, a vigorous and plethoric habit should in every case exist prior to the appearance of gout; which is by no means consistent with fact: nor is it true that a vigorous and plethoric habit is liable at a certain age to a loss of tone in the extremities; which is another necessary condition in the hypothesis. Loss of tone often occurs in the extremities without exerting any peculiar influence on the stomach; and why a loss of tone in the stomach should excite the *vis medicatrix naturæ*, to restore it by exciting an inflammatory affection in some part of the extremities, is very inconceivable. Were the hypothesis true, every dyspeptic patient should infallibly be affected with gout; which, however, is by no means the case. In short, every step in the theory is liable to unsurmountable objections; and it by no means, any more than former hypotheses, explains the phenomena of the disease, particularly what Dr Cullen has himself so accurately pointed out, the connection of gouty with calculous complaints.

A very ingenious work has lately been published by an anonymous author, entitled "a Treatise on Gravel and upon Gout;" in which the sources of each are investigated, and effectual means of preventing or removing these diseases recommended. In this treatise an attempt is made to prove, that both diseases depend upon a peculiar concreting acid, the acid of calculi, or the *lithic acid*, as it has been styled by some. He supposes this acid, constantly present to a certain degree in the circulating fluids, to be precipitated by the introduction of other acids; and in this manner he explains the influence of acid wines and other liquors, as claret, cyder, &c. inducing gout; for he considers the circumstance chiefly constituting the disease as being an inflammation in parts of which the functions have been interrupted by the redundant acid precipitated. Although this theory be supported with much ingenuity, yet it is also liable to many objections. The sudden attack of the affection; its sudden transition from one part of the body to another; the instant relief of one part when another comes to be affected; and the various anomalous forms which the disease puts on, having an exact resemblance to different affections; are altogether irreconcileable to the idea of its depending on any fixed obstruction at a particular part arising from concreting acid. Nor does the plan of prevention and cure which he proposes, and which consists chiefly in abstinence from acid and in the destruction of acid, by any means correspond in every particular to be best established facts respecting the treatment of gout; to which we next proceed.

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It would perhaps have been happy for gouty persons if this opinion had been implicitly received by them; as it would have prevented their having been so often the dupes of self-interested pretenders, who have either amused them with inert medicines, or have rashly employed those of the most pernicious tendency. Dr Cullen, who has treated of the cure of the disease with great judgment, as he has done the theory with much ingenuity, is much disposed to believe the impossibility of a cure of the gout by medicines; and more certainly still inclined to think, that, whatever may be the possible power of medicines, yet no medicine for curing the gout has hitherto been found. Although almost every age has presented a new remedy, all hitherto offered have, very soon after, been either neglected as useless, or condemned as pernicious

But, though unwilling to admit the power of medicines, yet he contends, that a great deal can be done towards the cure of the gout by a regimen: and he is firmly persuaded, that any man who, early in life, will enter upon the constant practice of bodily labour, and of abstinence from animal-food, will be preserved entirely from the disease.

Whether there be any other means of radically curing the gout, the Doctor is not ready to determine. There are histories of cases of the gout, in which it is said, that by great emotions of mind, by wounds, and by other accidents, the symptoms have been suddenly relieved, and never again returned; but how far these accidental cures might be imitated by art, or would succeed in other cases, is at least extremely uncertain.

The practices proper and necessary in the treatment of the gout, are to be considered under two heads: *First*, As they are to be employed in the intervals of paroxysms; or, *secondly*, As during the time of these. In the intervals of paroxysms, the indications are, to prevent altogether the return of paroxysms; or at least to render them less frequent, and more moderate. During the time of paroxysms, the indications are, to moderate the violence and shorten the duration of them as much as can be done with safety.

It has been already observed, that the gout may be entirely prevented by constant bodily exercise, and by a low diet; and Dr Cullen is of opinion, that this prevention may take place even in persons who have a hereditary disposition to the disease. Even when the disposition has discovered itself by several paroxysms of inflammatory gout, he is persuaded that labour and abstinence will absolutely prevent any returns of it for the

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the rest of life. These, therefore, are the means of answering the first indication to be pursued in the intervals of paroxysms.

Exercise in persons disposed to the gout, in Dr Cullen's opinion, has effect by answering two purposes: One of these is the strengthening of the tone of the extreme vessels; and the other, the guarding against a plethoric state. For the former, if exercise be employed early in life, and before intemperance has weakened the body, a very moderate degree of it will answer the purpose; and, for the latter, if abstinence be at the same time observed, little exercise will be necessary.

With respect to exercise, this in general is to be observed, that it should never be violent; for, if violent, it cannot be long continued, and must always endanger the bringing on an atony in proportion to the violence of the preceding exercise.

It is also to be observed, that the exercise of gestation, though considerable and constant, will not, if it be entirely without bodily exercise, answer the purpose in preventing the gout. For this end, therefore, the exercise must be in some measure that of the body; and must be moderate, but at the same time constant and continued through life.

In every case and circumstance of the gout in which the patient retains the use of his limbs, bodily exercise, in the intervals of paroxysms, will be always useful; and in the beginning of the disease, when the disposition to it is not yet strong, exercise may prevent a paroxysm which otherwise might have come on. In more advanced states of the disease, however, when there is some disposition to a paroxysm, much walking will bring it on; either as it weakens the tone of the lower extremities, or as it excites an inflammatory disposition in them: and thus it seems to be that strains or contusions often bring on a paroxysm of the gout.

Abstinence, the other part of the proper regimen for preventing the gout, is of more difficult application. If an abstinence from animal food be entered upon early in life, while the vigour of the system is yet entire, Dr Cullen has no doubt of its being both safe and effectual: but if the motive for this diet shall not have occurred till the constitution has been broken by intemperance, or by the decline of life, a low diet may then endanger the bringing on an atonic state.

Further, if a low diet be entered upon only in the decline of life, and be at the same time a very great change from the former manner of living, the withdrawing of an accustomed stimulus of the system may readily throw this into an atonic state.

The safety of an abstemious course may be greater or less according to the management of it. It is animal food which especially disposes to the plethoric and inflammatory state, and that food is to be therefore especially avoided; but, on the other hand, vegetable aliment of the lowest quality is in danger of weakening the system too much by not affording sufficient nourishment, and more particularly of weakening the tone of the stomach by its acescency. It is therefore a diet of a middle nature that is to be chosen; and milk is precisely of this kind, as containing both animal and vegetable matter.

As approaching to the nature of milk, and as being a vegetable matter containing the greatest portion of nourishment, the farinaceous seeds are next to be chosen, and are the food most proper to be joined with milk.

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With respect to drink, fermented liquors are useful only when they are joined with animal food, and that by their acescency; and their stimulus is only necessary from custom. When, therefore, animal food is to be avoided, fermented liquors are unnecessary; and by increasing the acescency of vegetables, these liquors may be hurtful. The stimulus of fermented or spirituous liquors is not necessary to the young and vigorous, and when much employed impairs the tone of the system. These liquors, therefore, are to be avoided, except so far as custom and the declining state of the system may have rendered them necessary. For preventing or moderating the regular gout, water is the only proper drink.

With respect to an abstemious course, it has been supposed, that an abstinence from animal food and fermented liquors, or the living upon milk and farinacea alone for the space of one year, might be sufficient for a radical cure of the gout: and it is possible that, at a certain period of life, in certain circumstances of the constitution, such a measure might answer the purpose. But this is very doubtful: and it is more probable, that the abstinence must, in a great measure, be continued, and the milk-diet be persisted in, for the remainder of life. It is well known, that several persons who had entered on an abstemious course, and had been thereby delivered from the gout, have, however, upon returning to their former manner of full living, had the disease return upon them with as much violence as before, or in a more irregular and more dangerous form.

It has been alleged, that, for preventing the return of the gout, blood-letting or scarifications of the feet, frequently repeated, and at stated times, may be practised with advantage; but of this Dr Cullen tells us he has had no experience; and the benefit of the practice is not, as far as we know, confirmed by the observation of any other practitioner.

Exercise and abstinence are the means of avoiding the plethoric state which gives the disposition to the gout; and are therefore the means proposed for preventing the paroxysms, or at least for rendering them less frequent and more moderate. But many circumstances prevent the steadiness necessary in pursuing these measures: and therefore, in such cases, unless great care be taken to avoid the exciting causes, the disease may frequently return: and, in many cases, the preventing of paroxysms is chiefly to be obtained by avoiding those exciting causes already enumerated.

A due attention in avoiding these different causes will certainly prevent fits of the gout; and the taking care that the exciting causes be never applied in a great degree, will certainly render fits more moderate when they do come on. But, upon the whole, it will appear, that a strict attention to the general conduct of life, is in this matter necessary; and therefore, when the predisposition has taken place, it will be extremely difficult to avoid the disease.

Dr Cullen is firmly persuaded, that, by obviating the predisposition, and by avoiding the exciting causes, the gout may be entirely prevented: but, as the mea-

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fures neceffary for this purpofe will, in moft cafes, be purfued with difficulty, and even with reluctance, men have been very defirous to find a medicine which might anfwer the purpofe without any reftraint on their manner of living. To gratify this defire, phyficians have propofed, and, to take advantage of it, empirics have feigned, many remedies. Of what nature feveral of thefe remedies have been, it is difficult to fay: but of thofe which are unknown, we conclude, from their having been only of temporary fame, and from their having foon fallen into neglect, that they have been either inert or pernicious, and therefore fhall make no inquiry after them; and fhall now remark only upon one or two known remedies for the gout which have been lately in vogue.

One of thefe is what has been named in England the *Portland powder*. This is not a new medicine, but is mentioned by Galen, and, with fome little variation in its compofition, has been mentioned by the writers of almoft every age fince that time. It appears to have been at times in fafhion, and to have again fallen into neglect; and Dr Cullen thinks that this laft has been owing to its having been found to be, in many inftances, pernicious. In every inftance which he has known of its exhibition for the length of time prefcribed, the perfons who had taken it were indeed afterwards free from any inflammatory affection of the joints; but they were affected with many fymptoms of the atonic gout; and all, foon after finifhing their courfe of the medicine, have been attacked with apoplexy, afthma, or dropfy, which proved fatal.

Another remedy which has had the appearance of preventing the gout, is an alkali in various forms; fuch as the fixed alkali, both mild and cauftic, lime-water, foap, and abforbent earths; and of late the alkaline aerated water has been more fafhionable than any other. Since it became common to exhibit thefe medicines in nephritic and calculous cafes, it has often happened that they were given to thofe who were at the fame time fubject to the gout; and it has been obferved, that under the ufe of thefe medicines, gouty perfons have been longer free from the fits of their difeafe. That, however, the ufe of thefe medicines has entirely prevented the returns of gout, Dr Cullen does not know; becaufe he never pufhed the ufe of thofe medicines for a long time, being apprehenfive that the long-continued ufe of them might produce a hurtful change in the ftate of the fluids.

As the preventing the gout depends very much on fupporting the tone of the ftomach, and avoiding indigeftion; fo coftivenefs, by occafioning this, is very hurtful to gouty perfons. It is therefore neceffary for fuch perfons to prevent or remove coftivenefs, and by a laxative medicine, when needful; but it is at the fame time proper, that the medicine employed fhould be fuch as may keep the belly regular, without much purging. Aloetics, rhubarb, magnefia alba, oleum ricini, or flowers of fulphur, may be employed, as the one or the other may happen to be beft fuited to particular perfons.

Thefe are the feveral meafures to be purfued in the intervals of the paroxyfms; and we are next to mention the meafures proper during the time of them.

As during the time of paroxyfms the body is in a feverifh ftate, no irritation fhould then be added to it; every part, therefore, of the antiphlogiftic regimen, except the application of cold, ought to be ftrictly obferved.

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Another exception to the general rule may occur when the tone of the ftomach is weak, and when the patient has been before much accuftomed to the ufe of ftrong drink; for then it may be allowable, and even neceffary, to give fome animal-food and a little wine.

That no irritation is to be added to the fyftem during the paroxyfms of gout, except in the cafes mentioned, is agreed upon among phyficians: but it is a more difficult matter to determine, whether, during the time of paroxyfms, any meafures may be purfued to moderate the violence of reaction and of inflammation. Dr Sydenham has given it as his opinion, that the more violent the inflammation and pain, the paroxyfm will be the fhorter, as well as the interval between the prefent and the next paroxyfm longer: and, if this opinion be admitted as juft, it will forbid the ufe of any remedies which might moderate the inflammation; which is, to a certain degree, undoubtedly neceffary for the health of the body. On the other hand, acute pain preffes for relief; and although a certain degree of inflammation may feem abfolutely neceffary, it is not certain but that a moderate degree of it may anfwer the purpofe; and it is even probable, that in many cafes the violence of inflammation may weaken the tone of the parts, and thereby invite a return of paroxyfms. It feems to be in this way, that, as the difeafe advances, the paroxyfms become more frequent.

From thefe laft confiderations, it feems probable, that, during the time of paroxyfms, fome meafures may be taken to moderate the violence of the inflammation and pain, and particularly, that in firft paroxyfms, and in the young and vigorous, blood-letting at the arm may be practifed with advantage: but this practice cannot be repeated often with fafety; becaufe blood-letting not only weakens the tone of the fyftem, but may alfo contribute to produce plethora. However, bleeding by leeches on the foot, and upon the inflamed part, may be practifed and repeated with greater fafety; and inftances have been known of its having been employed with fafety to moderate and fhorten paroxyfms; but how far it may be carried, we have not had experience enough to determine.

Befides blood-letting and the antiphlogiftic regimen, it has been propofed to employ remedies for moderating the inflammatory fpafm of the part affected, fuch as warm bathing and emollient poultices. Thefe have fometimes been employed with advantage and fafety; but, at other times, have been found to give occafion to a retroceffion of the gout.

Bliftering is a very effectual means of relieving and difcuffing a paroxyfm of the gout; but has alfo frequently had the effect of rendering it retrocedent. The ftinging with nettles is analogous to bliftering; and probably would be attended with the fame danger. The burning with moxa, or other fubftance, is a remedy of the fame kind; but though not found hurtful, there is no fufficient evidence of its proving a radical cure.

Camphire, and fome aromatic oils, have the power of

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of allaying the pain, and of removing the inflammation from the part affected: but these remedies commonly make the inflammation only shift from one part to another, and therefore with the hazard of its falling upon a part where it may be more dangerous; and they have sometimes rendered the gout retrocedent.

From these reflections it will appear, that some danger must attend every external application to the parts affected during a paroxysm; and that therefore the common practice of committing the person to patience and flannel alone, is established upon the best foundation. Opiates give the most certain relief from pain; but, when given in the beginning of gouty paroxysms, it has by some been thought that they occasion these to return with greater violence. When, however, the paroxysms shall have abated in their violence, but still continue to return, so as to occasion painful and restless nights, opiates may be given with safety and advantage; especially in the case of persons advanced in life, and who have been often affected with the disease. When, after paroxysms have ceased, some swelling and stiffness still remain in the joints, these symptoms are to be discussed by the diligent use of the flesh-brush. Purging immediately after a paroxysm will be always employed with the hazard of bringing it on again.

Thus far of the REGULAR gout. We now proceed to consider the management of the disease when it has become IRREGULAR.

In the *atonic* gout, the cure is to be accomplished by carefully avoiding all debilitating causes; and by employing, at the same time, the means of strengthening the system in general, and the stomach in particular.

For strengthening the system in general, Dr Cullen recommends frequent exercise on horseback, and moderate walking. Cold bathing also may answer the purpose; and may be safely employed, if it appear to be powerful in stimulating the system, and be not applied when the extremities are threatened with any pain.

For supporting the tone of the system in general, when threatened with atonic gout, some animal food ought to be employed, and the more acescent vegetables ought to be avoided. In the same case, some wine also may be necessary; but it should be in moderate quantity, and of the least acescent kinds, and if every kind of wine shall be found to increase the acidity of the stomach, ardent spirits and water must be employed.

For strengthening the stomach, bitters and the Peruvian bark may be employed; but care must be taken that they be not constantly employed for any great length of time.

The most effectual medicine for strengthening the stomach is iron, which may be employed under various preparations; but the best appears to be the rust in fine powder, which may be given in large doses.

For supporting the tone of the stomach, aromatics may be employed; but should be used with caution, as the frequent and copious use of them have an opposite effect; and they should therefore be given only in compliance with former habits, or for palliating present symptoms.

When the stomach happens to be liable to indigestion, gentle vomits may be frequently given, and proper laxatives should be always employed to obviate or to remove costiveness.

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In the atonic gout, or in persons liable to it, to guard against cold is especially necessary; and the most certain means of doing this, is by repairing to a warm climate during the winter season. In the more violent cases, blistering the lower extremities may be useful; but that remedy should be avoided when any pain threatens the extremities. In persons liable to the atonic gout, issues may be established in the extremities as in some measure a supplement to the disease.

A second case of the irregular gout, is the *retrocedent*.

When this affects the stomach and intestines, relief is to be instantly attempted by the free use of strong wines, joined with aromatics, and given warm; or, if these shall not prove powerful enough, ardent spirits must be employed, and are to be given in a large dose. In moderate attacks, ardent spirits, impregnated with garlic or with asafœtida, may be employed; or, even without the ardent spirits, a solution of asafœtida, with the volatile alkali, may answer the purpose. Opiates are often an effectual remedy; and may be joined with aromatics, as in the electuarium opiatum; or they may be usefully joined with volatile alkali and camphire. Musk has likewise proved useful in this disease.

When the affection of the stomach is accompanied with vomiting, this may be encouraged, by taking draughts of warm wine, at first with water, and afterwards without it; having at length recourse, if necessary, to some of the remedies above mentioned, and particularly the opiates.

In like manner, if the intestines be affected with diarrhœa, this is to be at first encouraged by taking plentifully of weak broth; and when this shall have been done sufficiently, the tumult is to be quieted by opiates.

When the retrocedent gout shall affect the lungs, and produce asthma, this is to be cured by opiates, by antispasmodics, and perhaps by blistering on the back or breast.

When the gout, leaving the extremities, shall affect the head, and produce pain, vertigo, apoplexy, or palsy, our resources are very precarious. The most probable means of relief is, blistering the head; and, if the gout shall have receded very entirely from the extremities, blisters may be applied to these also. Together with these blisterings, aromatics, and the volatile alkali, may be thrown into the stomach.

The third case of the irregular gout is the *misplaced*; that is, when the inflammatory affection of the gout, instead of falling upon the extremities, falls upon some internal part. In this case, the disease is to be treated by blood-letting, and by such other remedies as would be proper in an idiopathic inflammation of the same parts.

Whether the translation so frequently made from the extremities to the kidneys, is to be considered as an instance of the misplaced gout, seems uncertain: but Dr Cullen is disposed to think it something different; and therefore is of opinion, that, in the *nephralgia calculosa* produced upon this occasion, the remedies of inflammation are to be employed no farther than they may

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may be otherwise sometimes necessary in that disease, arising from other causes than the gout.

To this dissertation on the gout, taken from the works of our late learned professor, we cannot help subjoining a very uncommon case published by Dr Samuel Pye in the London Medical Transactions, where the gout would seem to have been occasioned by a morbific matter, and to have been cured by the evacuation of it.

"Mr Major Rook, surgeon and apothecary in Upper Shadwell, of about 45 years of age, a sober, temperate man, of a good habit of body, accustomed to no disease but the gout; the returns of the fits whereof had never been more frequent than once in 12 or 14 months, about the month of June 1752 was seized with a very severe paroxysm of the gout. As I had known some extraordinary effects proceeding from a vegetable diet in that distemper, particularly in one gentleman, who, by a total abstinence from all manner of food except cow's milk, and that without bread, had cured himself of this disease; and who, at the time I mentioned the case to my friend, was in the 13th year of his milk-diet; I persuaded Mr Rook to try what vegetables would do for him: he readily complied, and entered upon it immediately, with a resolution, that, if it answered his expectation, he would renounce fish and flesh for ever.

"But after the most religious abstinence from animal food of every kind for eleven weeks, being visited by a gentle attack in both feet, he returned immediately to his animal food. This paroxysm continued but 48 hours; but in March 1753 was succeeded by a very severe one in both feet.

"The pain in his feet, heels, and ankles, increased with great violence for about 10 or 12 days; till at length he was in the most extreme agonies; such as he had never felt before, and such as almost made him mad. In the height of this extremity, the pains (it is his own expression) from the feet, heels, and ankles, flew as quick as lightning directly to the calves of his legs; but remaining there not half a minute, and not in the least abating of their extreme violence (though the feet, heels, and ankles, were left entirely free from pain), from the calves, after a short stay of about half a minute, the pains ascended with the same velocity as before to both the thighs, at the same time leaving the calves of the legs free from pain: from the thighs, in less than the space of one minute, and as quick as before, they arrived at the abdomen; and after giving the patient one most severe twitch in the bowels, they reached the stomach: here the pains and here the fit ended, upon the patient's vomiting up about a pint and a half of a green aqueous liquor, but so extremely corrosive, that he compared it to the strongest mineral acid.

"This extraordinary crisis happened at about two in the morning: immediately after this discharge he fell asleep, and slept till seven or eight, and waked perfectly easy in every part, no signs of the distemper remaining but the swelling and tenderness of his feet; both of which went off gradually, so that in two days he was able to walk about his business.

"The next fit seized him in February 1754, in the common way; but was less violent than the former, and continued for about six weeks; during which time he had three increased paroxysms, or distinct smart fits, which held him about two hours each; in the last of which he had the same critical discharge, by vomiting of the same corrosive matter, preceded by the same uncommon symptoms as in the fit of 1753. But mending every hour, he was able the very next day to walk, and attend his patients, with more ease than after the first mentioned fit; for the swelling abated much sooner, and in three days disappeared.

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"I have said, that this last fit was attended with three distinct paroxysms, the last of which ended as above: yet to show the disposition of nature, in this case, to throw off the offending humour in this her new way, it is remarkable, that in the two first of these increased paroxysms of pain, the patient declared to me that he never had the least ease till he had vomited; but as there was no translation of the pain before these vomitings, there was none of that corrosive matter to be dischaged; nothing but the common contents of the stomach was to be seen. These vomitings, however, procured the patient some ease; but the fit of the gout went on till the third paroxysm was over, which ended as has been related.

"As the crisis in this case is uncommon, I must take notice of a symptom or two, which were no less extraordinary, in both these fits of the gout.

"A most profuse sweat attended the patient every morning during the whole course of the fits; which was so very offensive, and at the same time his breath so uncommonly stinking, that neither the patient himself, nor those who waited on him, were ever sensible of the like.

"His linen was tinged as with saffron; and his urine very high coloured, of almost as deep a red as claret: but, upon the critical vomitings, every one of these symptoms disappeared with the disease.

"On the 9th of December 1755, he was attacked again in one foot. The symptoms, however, were so very mild, that he took no notice of them to his family till the 12th: from that day the pain was aggravated, and the swelling greatly increased, by walking and riding in a coach. On the 17th it became extremely violent, particularly in the heel; when it instantaneously left the parts affected, and in the same manner and with equal velocity (as in the two former fits), it flew into the calves of his legs, thighs, and abdomen; and when it had reached the stomach, it caused him to vomit the same kind of corrosive acid as in the two former fits; and though the quantity was no more than a tea-spoonful, he became perfectly well in two days.

"The same symptoms of fetid urine, and offensive sweats, attended the patient in this short paroxysm as in those of 1753 and 1754; the sweat continued but two nights, and the urine fetid only 48 hours.

"As Mr Rook had experienced so great and happy effects from the former critical vomitings, he was greatly disappointed upon finding the quantity evacuated so very small; for which reason he immediately attempted to increase it, by drinking three pints of warm water (which was at hand), but in vain; for neither that, nor the use of his finger, could provoke to an evacuation, which was begun and finished by nature: for though the quantity evacuated was so very small, yet as it was equally corrosive, and produced the same effect, Phlegmasiæ effect, the discharge must be accounted as truly critical as the others were.

"During the first of these fits, in the year 1752, a hard tumor had appeared on the side of the metatarsus near the middle of the right foot, which continued till after the third critical vomiting; when it was resolved, and totally disappeared, upon the discharge of a viscid matter like the white of an egg, with a few small chalk-stones from the end of the middle toe of the same foot. This discharge happened about four or five days before the patient was seized with a regular fit in April 1755. But it is to be remarked, that this last fit continued three or four weeks, and went off in the common way, without any of the critical discharges of vomiting, urine, or sweat; but left on one hand three, and on the other two, fingers loaded with chalk stones; with this peculiar symptom, that when the weather was cold those fingers were affected with a most exquisite pain, which was always removed by heat.

"But not long after this last mentioned fit, a large quantity of chalk-stones were extracted from the bottom of the left foot, near the ball of the great toe, and that from time to time for about three or four months. On the 19th of January 1756 (the wound occasioned by the chalk-stones being still open), he was seized with a fever, without any symptom of the gout: the fever went off on the third day, with the same kind of critical sweat and urine as always accompanied the acid vomitings in the fore mentioned fits. On the fourth day from the attack of the fever, a fit of the gout came on, with the common symptoms, in both feet; which continued with violence for about a week, with frequent retching and vomiting, but without bringing up more than the common contents of the stomach. At this time an uncommon itching in the bottom of the foot and ball of the great toe from whence the chalk-stones had been extracted, tormented the patient for five or six hours; upon his gently rubbing the part, he was very sensible of a fluctuation of some matter, which soon appeared to flow at first in small quantities from the open orifice in the ball of the toe: upon pressing the part, about a tea-cup full of a liquid chalky matter was collected. The next morning the patient made a large opening with an imposthume knife, which produced more than half a pint of a bloody serous matter, full of chalk stones, which proved as truly critical as the vomitings of the corrosive acid did in the cases above mentioned; for the orifice from whence the chalk stones first issued, was very soon healed, and the gentleman continues in perfect health."

216 GENUS XXV. ARTHROPUOSIS.

Lumbago psoadica, *Sauv.* sp. 6. *Fordyce*, Practice of Physic, P. II. p. 70.
Lumbago apostematosa, *Sauv.* sp. 12.
Lumbago ab arthrocace, *Sauv.* sp. 17.
Ischias ex abscessu, *Sauv.* sp. 6.
Morbus coxarius, *De Haen*, Rat. Med. Vol. I. c. xxxii.

THIS is a disease very much resembling the rheumatism; but differing both from it and the gout, in that it occasions suppurations, which they seldom or never do. It frequently, according to Sauvages, attacks the psoas muscle; and occasions excruciating pains, and then collections of matter. Arthropuosis.

The only cure is, if suppuration cannot be prevented, to lay open the part where the matter is contained, which would otherwise be absorbed, and occasion a fatal hectic.

ORDER III. EXANTHEMATA. 217

Exanthemata, *Sag.* Class X.
Phlegmasiæ exanthematicæ, *Sauv.* Class III. Ord. I.
Morbi exanthematici, *Lin.* Class I. Ord. II.
Febres exanthematicæ, *Vog.* Class I. Ord. II.

GENUS XXVI. ERYSIPELAS. 218
St ANTHONY'S FIRE.

Erysipelas *Sauv.* gen. 97. *Lin.* 10. *Sag.* gen. 296.
Febris erysipelacea, *Vog.* 68. *Hoffm.* II. 98.

Sp. I. ERYSIPELAS with *Blisters*. 219

Erysipelas rosa, *Sauv.* sp. 1. *Sennert de febr.* lib. ii. c. 15.
Febris erysipelatosa, *Sydenham*, sect. vi. cap. 5.
Erysipelas typhodes, *Sauv.* sp. 2.
Erysipelas pestilens, *Sauv* sp. 5.
Erysipelas contagiosum, *Sauv* sp. 9.

Description. The erysipelas of the face, where this affection very frequently appears, comes on with a cold shivering, and other symptoms of pyrexia. The hot stage of this is frequently attended with a confusion of the head, and some degree of delirium; and almost always with drowsiness, and perhaps coma. The pulse is always frequent, and commonly full and hard.—When these symptoms have continued for one, two, or at most three days, an *erythema* appears on some part of the face. This at first is of no great extent; but gradually spreads from the part it first occupied to the other parts of the face, till it has affected the whole; and frequently from the face it spreads over the hairy scalp, or descends on some part of the cheek. As the redness spreads, it commonly leaves, or at least is abated in the parts it had before occupied. All the parts which the redness affects are also affected with some swelling, which continues for some time after the redness has abated. The whole face becomes considerably turgid; and the eye-lids are often so much swelled as entirely to shut up the eyes. When the redness and swelling have continued for some time, there commonly arise, sooner or later, blisters of a larger or smaller size on several parts of the face. These contain a thin colourless liquor, which sooner or later runs out. The surface of the skin, in the blistered places, sometimes becomes livid and blackish; but this seldom goes deeper, or discovers any degree of gangrene affecting the skin. On the parts of the face not affected with blisters, the cuticle suffers, towards the end of the disease, a considerable desquamation. Sometimes the tumor of the eye-lids ends in a suppuration.

The inflammation coming upon the face does not produce any remission of the fever which had before prevailed; and sometimes the fever increases with the spreading and increasing inflammation. The inflammation

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tion commonly continues for eight or ten days; and, for the same time, the fever and symptoms attending it also continue. In the progress of the disease, the delirium and coma attending it sometimes go on increasing, and the patient dies apoplectic on the seventh, ninth, or eleventh day of the disease. In such cases it has been commonly supposed, that the disease is translated from the external to the internal parts. But Dr Cullen thinks that the affection of the brain is merely a communication from the external affection, as this continues increasing at the same time with the internal. When the fatal event does not take place, the inflammation, after having affected the whole face, and perhaps the other external parts of the head, ceases, and with that the fever also; and, without any other crisis, the patient returns to his ordinary health. This disease is not commonly contagious; but as it may arise from an acrid matter externally applied, so it is possible that the disease may sometimes be communicated from one person to another. Persons who have once laboured under this disease are liable to returns of it.

Prognosis. The event of this disease may be foreseen from the state of the symptoms which denote more or less the affection of the brain. If neither delirium nor coma come on, the disease is seldom attended with any danger; but when these symptoms appear early in the disease, and are in a considerable degree, the utmost danger is to be apprehended.

Cure. The erysipelas of the face is to be cured, according to the opinion of most practitioners, much in the same manner as phlegmonic inflammations; by blood-letting, cooling purgatives, and by employing every part of the antiphlogistic regimen. Many observations, however, would lead us to conclude, that in not a few cases the concomitant fever has here a tendency to the typhoid type; and therefore evacuations apparently serviceable in the first instance have afterwards a bad effect. The evacuations of blood-letting and purging are to be employed more or less according to the urgency of symptoms; particularly those which mark an affection of the brain. As the pyrexia continues, and often increases with the inflammation of the face, so the evacuations abovementioned are to be employed at any time of the disease. When, however, the fever, in place of marks of the phlogistic diathesis particularly a full, hard, and strong pulse, is attended with symptoms of great debility, and with a small pulse easily compressible; evacuations, particularly under the form of blood-letting, must be used with very great caution. Even in such cases, however, the use of refrigerant cathartics may still be persisted in with more safety and greater advantage. But whether evacuants have been employed or not, when symptoms of debility run to a great height, and marks of a putrescent tendency appear, recourse must be had to wine and the Peruvian bark. In cases which at the commencement require evacuation, these are often in the after periods employed with very great benefit.

In this, as in other diseases of the head, when that part happens to be the seat of erysipelas, it is proper to put the patient, as often as he can easily bear it, into somewhat of an erect posture; and as in this disease there is always an external affection, so various external applications have been proposed to be made to the part affected; but almost all of them are of doubtful effect.

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An erysipelas frequently appears on other parts of the body besides the face, and such other erysipelatous inflammations frequently end in suppuration; but these cases are seldom dangerous. At coming on they are sometimes attended with drowsiness, and even with some delirium; but this seldom happens, and these symptoms do not continue after the inflammation is formed; and Dr Cullen does not remember to have seen an instance of the translation of an inflammation from the limbs to an internal part; and though these inflammations of the limbs be attended with pyrexia, they seldom require the same evacuations as the erysipelas of the face.

Sp. II. Erysipelas with *Phlyctenæ*. 220

Erysipelas zoster, *Sauv* sp. 8.
Zona; Anglis, *The* Shingles, *Russel* de tab. gland. p. 124. Hist. 35.
Herpes zoster, *Sauv.* sp. 9.

This differs from the former in no other way than in being attended with an eruption of phlyctenæ or small watery bladders on several parts of the body.—The method of cure is the same.

Gen. XXVII. PESTIS, the Plague. 221

Pestis, *Sauv.* gen. 91. *Lin.* 2. *Junck.* 78.
Febris pestilentialis, *Vog.* 33. *Hoffm.* II. 93.
Pestis benigna, *Sauv.* sp. 2. Pestis Massiliensis, Class III. Traité de la peste, p. 41. Ejusdem pestis, Cl. 5to Traité, p. 228.
Pestis remittens, *Sauv.* sp. 9.
Pestis vulgaris, *Sauv.* sp. 1. Pestis Massil. Cl. ii. Traité, p. 38. Ejusd. Cl. iii. & iv. Traité, p. 225, &c. *Waldschmidt.* de peste Holsatica, apud *Halleri* Diss. Pract. tom. v. *Chenot.* de peste Transylvanica, 1755, 1759, *De Haen*, Rat. Med. pars xiv.
Pestis Egyptiaca, *Sauv.* sp. 11. *Alpin.* de Med. Egypt.
Pestis interna, *Sauv.* sp. 3. Pest. Massil. Cl. I. Traité, p. 37—224.

History. Of this distemper Dr Cullen declines giving any particular history, because he never saw it; from the accounts of other authors, however, he is of opinion, that the circumstances peculiarly characteristic of it, especially of its more violent and dangerous states, are, 1. The great loss of strength in the animal functions, which often appears early in the disease. 2. The stupor, giddiness, and consequent staggering, which resembles drunkenness, or the head-ach and various delirium all of them denoting a great disorder in the functions of the brain. 3. Anxiety, palpitation, syncope, and especially the weakness and irregularity of the pulse, denoting a considerable disturbance in the action of the heart. 4. Nausea and vomiting, particularly the vomiting of bile, which shows an accumulation of vitiated bile in the gall-bladder and biliary ducts, and from thence derived into the intestines and stomach; and which denote a considerable spasm, and loss of tone in the extreme vessels on the

 surface

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surface of the body. 5. The buboes and carbuncles, which denote an acrimony prevailing in the fluids; and, lastly, The petechiæ, hæmorrhages, and colliquative diarrhœa, which denote a putrescent tendency prevailing in a great degree in the mass of blood.

To these characteristics of the plague enumerated by Dr Cullen, we shall add one mentioned by Sir John Pringle, which, though perhaps less frequent than the others, yet seems worthy of notice. It is this, That in the plague there is an extraordinary enlargement of the heart and liver. In nine dissections of bodies dead of the plague at Marseilles, this extraordinary enlargement of the heart is taken notice of in all of them, and of the liver in seven of them. The account was sent to the Royal Society by M. Didier, one of the physicians to the king of France, and has been published in the Philosophical Transactions In the first case, the author takes notice, that "the heart was of an extraordinary bigness; and the liver was of double the natural size.—Case 2. The heart was of a prodigious bigness, and the liver much enlarged.—Case 3. The heart double the natural bigness.—Case 4. The heart was very large, and the liver was bigger and harder than ordinary.—Case 5. The heart was of a prodigious bigness.—Case 6. The heart was larger than in its natural state; the liver also was very large.—Case 7. The heart was of a prodigious size, and the liver was very large.—Case 8. The heart was much larger than natural, and the liver of a prodigious size.—Case 9. The heart was double the natural bigness, and the liver was larger than ordinary."—This preternatural enlargement Dr Pringle thinks is owing to the relaxation of the solid parts, by which means they become unable to resist the impetus of blood, and therefore are easily extended; as in the case of infancy, where the growth is remarkably quick. And a similar enlargement he takes notice of in the scurvy, and other putrid diseases.

A very elaborate work has lately been published on the subject of the plague by Dr Patrick Russel, formerly physician to the British factory at Aleppo. In this work, a very full history is given of the various forms and varieties of the disease. He makes particular observations on the following symptoms, which, in addition to the pestilential eruptions, he considers as the most important concomitants of plague, *viz.* fever, delirium, coma, impediment or loss of speech, deafness, muddiness of the eyes, white tongue, state of the pulse, respiration, anxiety, pain at the heart, inquietude, debility, fainting, convulsion, appearances of the urine, perspiration, vomiting, looseness, and hæmorrhagy; and he concludes these remarks with some observations on the occurrence of the plague with pregnant women. To point out more distinctly the stable varieties of the disease, he arranges the pestilential cases which fell under his observation at Aleppo under six classes: and he concludes his description with a very minute and particular account of the pestilential eruptions, appearing under the form either of buboes, carbuncles, or other exanthemata The presence of the two first, he observes, either separately or conjunctly, leaves the nature of the distemper unequivocal. But fatal has been the error of rashly pronouncing a distemper not to be a plague from their absence. Buboes affected the inguinal, axillary, parotid, maxillary, and cervical glands. But the first were the most commonly affected, and the two latter seldom observed to swell, without either the parotid swelling at the time or soon after. Of the carbuncles, Dr Russel describes five different varieties. The other exanthemata, which he observed sometimes, though less frequently, attending the plague, were petechiæ, a marbled appearance of the skin, an erysipelatous redness, streaks of a reddish purple or livid colour, vibices or weals, and large blue or purple spots, the *maculæ magnæ* of authors. In some cases, an extraordinary concurrence of eruptions took place, which was chiefly observed among children under 10 years of age

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Causes, &c. From a consideration of the symptoms above-mentioned, Dr Cullen concludes, that the plague is owing to a specific contagion, often suddenly producing the most considerable debility in the nervous system or moving powers, and a general putrescency in the fluids. Dr Russel also considers the disease as being universally the consequence of what may be called *pestilential contagion*; and has judiciously repelled the objections which have been brought against this doctrine.

Prevention. Here we must refer to all those methods of preventing and removing the incipient contagion of putrid fevers, which have been so fully enumerated. Dr Cullen is persuaded that the disease never arises in the northern parts of Europe, but in consequence of being imported from some other country. The magistrate's first care therefore ought to be to prevent the importation; and this may generally be done by a due attention to bills of health, and to the proper performance of quarantines.—With respect to the latter, he is of opinion, that the quarantines of persons may with safety be much less than 40 days; and if this were allowed, the execution of the quarantine would be more exact and certain, as the temptation to break it would be in a great measure avoided. With respect to the quarantine of goods, it cannot be perfect unless the suspected goods be unpacked, duly ventilated, and other means be employed for correcting the infection they may carry; and if all this be properly done, it is probable that the time commonly prescribed for quarantine may be also shortened.

A second measure in the way of prevention is required, when an infection has reached and prevailed in any place, to prevent that infection from spreading into others. This can only be done by preventing the inhabitants or the goods of any infected place from going out of it till they have undergone a proper quarantine.

The third measure, and which ought to be employed with great care, is, to prevent the infection from spreading among the inhabitants of a place in which it has arisen. And in this case, a great deal may be done by the magistrate, 1 By allowing as many of the inhabitants as are free from infection, and are not necessary to the service of the place, to go out of it. 2. By discharging all assemblies, or unnecessary intercourse of the people. 3. By ordering some necessary communications to be performed without contact. 4. By making such arrangements and provisions

visions as may render it easy for the families remaining to shut themselves up in their own houses. 5. By allowing persons to quit houses where an infection appears, upon condition that they go into lazarettoes. 6. By ventilating and purifying, or destroying, at the public expence, all infected goods. 7. By avoiding hospitals, and providing separate apartments for infected persons.

The fourth and last part of the business of prevention respects the conduct of persons necessarily remaining in infected places, especially those obliged to have some communication with persons infected. Those obliged to remain in places infected, but not to have any near communication with the sick, must avoid all near communication with other persons or their goods; and it is probable, that a small distance will serve, if, at the same time, there be no stream of air to carry the effluvia of persons or goods to some distance. Those who are obliged to have a near communication with the sick ought to avoid any of the debilitating causes which render the body susceptible of infection, as a spare diet, intemperance in drinking, excess in venery, cold, fear, or other depressing passions of the mind. A full diet of animal food is also to be avoided, because it increases the irritability of the body, and favours the operation of contagion; and indigestion, whether from the quantity or quality of the food, contributes very much to the same.

Besides these, it is probable that the moderate use of wine and spirituous liquors, moderate exercise, and the cold bath, may be of use; tonic medicines also, of which the Peruvian bark is deservedly accounted the chief, may likewise be used with some probability of success. If any thing is to be expected from antiseptics, Dr Cullen thinks camphor preferable to any other. In general, however, every one is to be indulged in the medicine of which he has the best opinion, provided it is not evidently hurtful. Whether issues be useful in preserving from the effects of contagion, is a matter of doubt. Dr Russel in his treatise enters very fully into the consideration of the means of prevention, both with respect to quarantines, lazarettoes, and bills of health. He is of opinion, that the present laws on these subjects are in many respects defective: and he thinks, that a set of new regulations would have the best chance of a deliberate and impartial discussion in the senate, if the inquiry were taken at a time free from all apprehension of immediate danger.

Cure. Here, according to Dr Cullen, the indications are the same as in fever in general, but are not all equally important. The measures for moderating the violence of reaction, which operate by diminishing the action of the heart and arteries, have seldom, he thinks, any place here, excepting that the antiphlogistic regimen is generally proper. Some physicians have recommended bleeding, and Sydenham even seems to think it an effectual cure; but Dr Cullen supposes, that for the most part it is unnecessary, and in many cases might do much hurt. Dr Russel, however, who on this subject speaks from experience and actual observation, is of a different opinion. With most of his patients, a single bleeding was employed with advantage; and even where the sick under his inspection were bled oftener than once, he did not find that the low state was thereby hurried on. Purging has also been recommended; and in some degree it may be useful in drawing off the putrescent matter frequently present in the intestines; but a large evacuation this way may certainly be hurtful.

The moderating the violence of reaction, as far as it can be done, by taking off the spasm of the extreme vessels, is a measure, in Dr Cullen's opinion, of the utmost necessity in the cure of the plague; and the whole of the means formerly mentioned, as suited to this indication, are extremely proper. The giving an emetic, at the first approach of the disease, would probably be of great service; and it is probable, that, at some other periods of the disease, emetics might be useful, both by evacuating bile abounding in the alimentary canal, and by taking off the spasm of the extreme vessels. Indeed Baron Ash, and some other of the Russian practitioners, represent the early and repeated use of emetics as the only effectual mode of cure.

From some principles with respect to fever in general, and with respect to the plague in particular, Dr Cullen is of opinion, that after the exhibition of the first vomit, the body should be disposed to sweat; but this sweat should be raised only to a moderate degree, though it must be continued for 24 hours or more if the patient bears it easily. The sweating is to be excited and conducted according to the rules laid down under SYNOCHA; and must be promoted by the plentiful use of diluents rendered more grateful by vegetable acids, or more powerful by being impregnated with some portion of neutral salts. To support the patient under the continuance of the sweat, a little weak broth, acidulated with the juice of lemons, may be given frequently, and sometimes a little wine if the heat of the body be not considerable. If sudorific medicines are judged necessary, opiates will be found most effectual and safe; but they should not be combined with aromatics, and probably may be more effectual if joined with a portion of emetics and of neutral salts. But if, notwithstanding the use of emetics and sudorifics in the beginning, the disease should still continue, the cure must turn upon the use of means for obviating debility and putrescency; and for this purpose tonic medicines, especially the Peruvian bark, and cold drink, are the most proper. For the treatment of buboes and carbuncles, see the article SURGERY.

GENUS XXVIII. VARIOLA. 222
The SMALL-POX.

Variola, *Sauv.* gen. 92. *Lin.* 3. *Sag.* gen. 290.
Febris variolosa, *Vog.* 25. *Hoffm.* II. 49.
Variolæ, *Boerh.* 1371. *Junck.* 76.

Sp. I. *The Distinct SMALL-POX.* 223

Variola discreta benigna, *Sauv.* sp. 2.
Variolæ regulares discretæ, *Sydenh.* sect. iii. cap. 2.
Variolæ discretæ simplices, *Helvet.* Ob. sp. 1.
Variola discreta complicata, *Sauv.* sp. 2. *Helvet.* sp. 2.
Variolæ anomalæ, *Sydenh.* sect. iv. cap. 6.
Variola discreta dysenteriodes, *Sauv.* sp. 4. *Sydenh.* sect. iv. cap. 1.
Variola discreta vesicularis, *Sauv.* sp. 5.
Variola discreta crystallina. *Mead* de variol. cap. 2.
Variola

Exanthemata. Variola discreta verrucosa, *Sauv.* sp. 6. *Mead* ibid.

Variola discreta siliquosa, *Sauv.* sp. 7. *Freind* Oper. p. 358.

Variola discreta miliaris, *Sauv.* sp. 8. *Helvet.* Obs. sp. 3.

224 Sp. II. *The Confluent* SMALL-POX.

Variola confluens, *Sauv.* sp. 9.

Variolæ regulares confluentes, ann. 1667. *Sydenham*, sect. iii. cap. 2.

Variolæ confluentes simplices, *Heloet.* Obs. sp. 1.

Variola confluens crystallina, *Sauv.* sp. 10.

Variola japonica, *Kempfer.*

Vesiculæ divæ Barbaræ, *C. Pis.* Obs. 149.

Variola confluens maligna, *Helvet.* Obs. sp. 1.

Variola confluens cohærens, *Sauv* sp. 11.

Variola confluens maligna, *Helvet.* sp. 2.

Variola confluens nigra, *Sauv.* sp. 12. *Sydenham*, sect. v. cap. 4.

Variola confluens maligna, *Helvet.* sp. 3.

Variola sanguinea, *Mead* de variolis, cap. 2.

Variola confluens corymbosa, *Sauv.* sp. 13.

Variola confluens maligna, *Helvet.* sp. 4.

Description. In the distinct small-pox, the disease begins with a synocha or inflammatory fever. It generally comes on about mid-day, with some symptoms of a cold stage, and commonly with a considerable langour and drowsiness. A hot stage is soon formed, and becomes more considerable on the second and third day. During this course children are liable to frequent startings from their slumbers; and adults, if they are kept in bed, are disposed to much sweating. On the third day, children are sometimes affected with one or two epileptic fits. Towards the end of the third day the eruption commonly appears, and gradually increases during the fourth; appearing first on the face, and successively on the inferior parts, so as to be completed over the whole body on the fifth day. From the third day the fever abates, and against the fifth it entirely ceases. The eruption appears first in small red spots hardly eminent, but by degrees rising into pimples There are generally but few on the face; but, even when more numerous, they are separate and distinct from one another. On the fifth or sixth day, a small vesicle, containing an almost colourless fluid, appears on the top of each pimple. For two days these vesicles increase in breadth only, and there is a small hollow pit in their middle, so that they are not raised into spheroidical pustules till the eighth day. These pustules from their first formation continue to be surrounded with an exactly circular inflamed margin, which when they are numerous diffuses some inflammation over the neighbouring skin, so as to give somewhat of a damask-rose colour to the spaces between the pustules As the pustules increase in size, the face swells considerably if they are numerous on it; and the eye-lids particularly are so much swelled, that the eyes are entirely shut. As the disease proceeds, the matter in the pustules becomes by degrees more opaque and white, and at length assumes a yellowish colour. On the 11th day the swelling of the face is abated, and the pustules seem quite full. On the top of each a darker spot appears; and at this place the pustule, on the 11th day, or soon after, is spontaneously broken, and a portion of the matter oozes out; in consequence of which the pustule is shrivelled, and subsides; while the matter oozing out dries, and forms a crust upon its surface. Sometimes only a little of the matter oozes out, and what remains in the pustule becomes thick and even hard. After some days, both the crusts and the hardened pustules fall off, leaving the skin which they covered of a brownish red colour; nor doth it resume its natural colour till many days after. In some cases, where the matter of the pustules has been more liquid, the crusts formed from it are later in falling off, and the part they covered suffers some desquamation, which occasions a small hollow or pit in it.

On the legs and hands the matter is frequently absorbed; so that at the height of the disease, these pustules appear as empty as vesicles. On the 10th and 11th days, as the swelling of the face subsides, a swelling arises in the hands and feet; but which again subsides as the pustules come to maturity. When the pustules on the face are numerous, some degree of pyrexia appears on the 10th and 11th days; but disappears again after the pustules are fully ripened, or perhaps remains in a very slight degree till the pustules on the feet have finished their course; and it is seldom that any fever continues longer in the distinct small-pox. When the pustules are numerous on the face, upon the sixth or seventh day some uneasiness of the throat, with a hoarseness of the voice, comes on, and a thin liquid is poured out from the mouth. These symptoms increase with the swelling of the face; and the liquids of the mouth and throat becoming thicker are with difficulty thrown out; and there is at the same time some difficulty in swallowing, so that liquids taken in to be swallowed are frequently rejected or thrown out by the nose. But all these affections of the fauces are abated as the swelling of the face subsides.

In the confluent small-pox all the symptoms abovementioned are much more severe. The eruptive fever particularly is more violent; the pulse is more frequent and more contracted, approaching to that state of pulse which is observed in typhus The coma is more considerable, and there is frequently a delirium. Vomiting also frequently attends, especially at the beginning of the disease. In very young infants epileptic fits are sometimes frequent on the first days of the disease, and sometime prove fatal before any eruption appears, or they usher in a very confluent and putrid small pox. But at the same time, it has been justly remarked by Dr Sydenham, and other accurate observers, that epileptic attacks more frequently precede distinct and mild than malignant and confluent small-pox. The eruption appears in the confluent more early on the third day, and it is frequently preceded or accompanied with an erysipelatous efflorescence. Sometimes the eruption appears in clusters, like the measles. When the eruption is completed, the pimples are always more numerous upon the face, and at the same time smaller and less eminent. Upon the eruption the fever suffers some remission, but never goes off entirely; and after the fifth or sixth day it increases again, and continues to be considerable throughout the remaining part of the disease. The vesicles formed on the

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the top of the pimples appear fooner; and while they increafe in breadth, they do not retain a circular, but are every way of an irregular figure. Many of them run into one another, infomuch that very often the face is covered with one vefícle rather than with a number of puftules. The vefícles, as far as they are anyway feparated, do not arife to a fpheroidal form, but remain flat, and fometimes the whole of the face is of an even furface. When the puftules are in any meafure feparated, they are not bounded by an inflamed margin, but the part of the fkin that is free from puftules is commonly pale and flaccid. The liquor that is in the puftules changes from a clear to an opaque appearance, and becomes whitifh or brownifh, but never acquires the yellow colour and thick confiftence that appears in the diftinct fmall-pox. The fwelling of the face, which only fometimes attends the diftinct fmall pox, always attends the confluent kind; it alfo comes on more early, and arifes to a greater height, but abates confiderably on the tenth or eleventh day. At this time the puftules or vefícles break and fhrivel; pouring out at the fame time a liquor, which is formed into brown or black crufts, which do not fail off for a long time after. Thofe of the face, in falling off, leave the fkin fubject to a defquamation, which pretty certainly produces pittings. On the other parts of the body the puftules of the confluent fmall-pox are more diftinct than on the face; but never acquire the fame maturity and confiftence of pus as in the properly diftinct kind — The falivation, which fometimes only attends the diftinct fmall-pox, very conftantly attends the confluent; and both the falivation and the affection of the fauces above-mentioned are, efpecially in adults, in a higher degree. In infants a diarrhœa comes frequently in place of a falivation.

In this kind of fmall-pox there is often a very confiderable putrefcency of the fluids, as appears from petechiæ, from ferous vefícles, under which the fkin fhows a difpofition to gangrene, and from bloody urine or other hæmorrhages; all of which fymptoms frequently attend this difeafe. In the confluent fmall-pox alfo, the fever, which had only fuffered a remiffion from the eruption to the maturation, at or immediately after this period is frequently renewed again with confiderable violence. This is what has been called the *fecondary fever*, and is of various duration and event.

Caufes, &c. It is evident that the fmall-pox is originally produced by a contagion; and that this contagion is a ferment with refpect to the fluids of the human body, which affimilates a great part of them to its own nature; or, at leaft, we have every reafon to believe that a fmall quantity of contagious matter introduced, is fomehow multiplied and increafed in the circulating fluids of the animal body. This quantity paffes again out of the body, partly by infenfible perfpiration, and partly by being depofited in puftules: The caufes which determine more of the variolous matter to pafs by perfpiration, or to form puftules, are probably certain circumftances of the fkin, which determine more or lefs of the variolous matter to ftick in it, or to pafs freely through it. The circumftance of the fkin, which feems to determine the variolous matter to ftick in it, is a certain ftate of inflammation depending much on the heat of it: thus we have many inftances of parts of the body, from being more heated, having a greater number of puftules than other parts. Thus parts covered with plafters, efpecially thofe of the ftimulant kind, have more puftules than others. —Certain circumftances alfo, fuch as adult age, and full living, determining to a phlogiftic diathefis, feem to produce a greater number of puftules, and *vice verfa*. It is therefore probable, that an inflammatory ftate of the whole fyftem, and more particularly of the fkin, gives occafion to a greater number of puftules; and the caufes of this may produce moft of the other circumftances of the confluent fmall-pox, fuch as the time of eruption, the continuance of the fever, the effufion of a more putrefcent matter, and lefs fit to be converted into pus, together with the form and other circumftances of the puftules.

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Prognofis. The more exactly the difeafe retains the form of the diftinct kind, it is the fafer; and the more completely the difeafe takes the form of the confluent kind, it is the more dangerous. It is only when the diftinct kind fhows a great number of puftules on the face or otherwife, by fever or putrefcency, approaching to the circumftances of the confluent, that the diftinct kind is attended with any danger.

In the confluent kind the danger is always very confiderable; and the more violent and permanent the fever is, the greater the danger; and efpecially in proportion to the increafe of the fymptoms of putrefcency. When the putrid difpofition is very great, the difeafe fometimes proves fatal before the eighth day; but in moft cafes death happens on the eleventh, and fometimes not till the fourteenth or feventeenth day.

Though the fmall-pox may not prove immediately fatal, the more violent kinds are often followed by a morbid ftate of the body, fometimes of very dangerous event. Thefe confequences, according to Dr Cullen, may be imputed fometimes to an acrid matter produced by the preceding difeafe, and depofited in different parts; and fometimes to an inflammatory diathefis produced and determined to particular parts of the body.

Cure. The art of medicine hath never yet afforded a method of preventing the eruption of the fmall-pox after the contagion is received; all that can be done is, to render the difeafe more mild, which is generally effected by INOCULATION. It is not to be fuppofed that 225
the mere giving of the infection artificially could make any difference in the nature of the difeafe, was it not that certain precautions are commonly ufed in the cafe of thofe who are inoculated, which cannot be ufed in the cafe of thofe who receive them naturally — Thefe meafures, according to Dr Cullen, are chiefly the following.

1. The choofing for the fubject of inoculation perfons otherwife free from difeafe, and not liable from their age or otherwife to any incidental difeafe.

2. The choofing that time of life which is moft favourable to a mild difeafe.

3. The choofing for the practice a feafon moft favourable to a mild difeafe.

4. The

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4. The preparing the perfon to be inoculated, by enjoining abftinence from animal-food for fome time before inoculation.

5. The preparing the perfon by courfes of mercurial and antimonial medicines.

6. The taking care at the time of inoculation to avoid cold, intemperance, fear, or other circumftances which might aggravate the future difeafe.

7. After thefe preparations and precautions, the choofing a fit matter to be employed in inoculation, by taking it from a perfon of a found conftitution, and free from any difeafe, or fufpicion of it; by taking it from a perfon who has had the fmall-pox of the moft benign kind; and laftly, by taking the matter from fuch perfon as foon as it has appeared in the puftules, either on the part inoculated, or on other parts of the body.

8. The introducing, by inoculation, but a fmall portion of the contagious matter.

9. After inoculation, the continuing of vegetable diet, and the employment of mercurial and antimonial medicines, and at the fame time employing frequent purging.

17. Both before and after inoculation, taking care to avoid external heat, either from the fun, artificial fires, warm chambers, much clothing, or being much in bed; and, on the contrary, expofing the perfon to a free and cool air.

11. Upon the appearance of the eruptive fever, the rendering that moderate by the employment of purgatives; by the ufe of cooling and antifeptic acids; and efpecially by expofing the perfon frequently to a cool, and even a cold air, at the fame time giving freely of cold drink.

12. After the eruption, the continuing the application of cold air, and the ufe of purgatives, during the courfe of the difeafe, till the puftules are fully ripened.

On thefe meafures Dr Cullen obferves, that, as the common infection may often feize perfons under a difeafed ftate, which may render the fmall-pox more violent, it is evident that inoculation muft have a great advantage by avoiding fuch concurrence. But as the avoiding of this may in the mean time frequently leave perfons expofed to the common infection, it is well worth while to inquire what are the difeafed ftates which fhould reftrain from the practice of inoculation. This is not yet fufficiently afcertained: for it hath been obferved, that the fmall pox has often occurred with a difeafed ftate of the body, without being thereby rendered more violent; and it hath alfo been obferved, that fome difeafes of the fkin are equally innocent. Dr Cullen is of opinion, that they are difeafes of the febrile kind, or fuch ailments as induce or aggravate a febrile ftate, that efpecially give the concurrence which is moft dangerous with the fmall-pox. He is alfo of opinion, that though a perfon be in a difeafed ftate, if that ftate be of uncertain nature and effect, and at the fame time the fmall-pox are very common in the neighbourhood, fo that it muft be extremely difficult to guard againft the common infection, it will always be fafer to give the fmall-pox by inoculation than to leave the perfon to take them by the common infection.

Though inoculation has been practifed with fafety upon perfons of all ages, yet there is reafon to conclude, that adults are more liable to a violent difeafe than perfons of younger years. At the fame time it is obferved, that children, in the time of their firft dentition, are liable, from the irritation of that, to have the fmall-pox rendered more violent; and that infants, before the time of dentition, upon receiving the contagion of the fmall-pox, are liable to be afflicted with epileptic fits, which frequently prove fatal. Hence it is evident, that though circumftances may admit and approve of inoculation at any age, yet for the moft part it will be advantageous to choofe perfons after the firft dentition is over, and before the time of puberty. But, in large cities in particular, if the operation be delayed till after dentition, the patient muft run many rifks of accidental infection, and thus many will be cut off by the natural fmall-pox who might have been faved by more early inoculation. Accordingly, in towns efpecially, it is now the common practice to inoculate infants when only three or four months old; and indeed accidents fo rarely happen, that it is almoft impoffible to conceive that greater fuccefs can be obtained at any other period of life.

The operation of inoculation may be performed at any feafon of the year; yet as it is certain that the cold of winter may increafe the inflammatory, and the heats of fummer increafe the putrefcent, ftate of the fmall-pox, it is highly probable that inoculation may have fome advantage from avoiding the extremes either of cold or heat.

As the ufe of animal-food may increafe both the inflammatory and putrefcent ftate of the human body, fo it muft render perfons, in receiving the contagion of the fmall-pox, lefs fecure againft a violent difeafe; and therefore inoculation may derive fome advantage by enjoining abftinence from animal-food for fome time before the operation is performed: but Dr Cullen is of opinion, that a longer time is neceffary than what is commonly prefcribed.

Mercurial and antimonial preparations may have fome effect in determining to a more free perfpiration, and therefore may be of fome ufe in preparing a perfon for the fmall-pox; but there are many obfervations which render their ufe doubtful. The quantity of both thefe medicines, particularly the antimony, commonly employed, is too inconfiderable to have any effects. Mercurials indeed have been often employed more freely; but even their falutary effects have not been evident, and they have fometimes been manifeftly productive of mifchief. It is therefore much to be doubted, whether inoculation really derives any benefit from thefe preparatory courfes or not.

It has been often obferved, in the cafe of almoft all contagions, that cold, intemperance, fear, and fome other circumftances, concurring with the application of the contagion, have greatly aggravated the future difeafe; it muft undoubtedly be the fame in the cafe of the fmall-pox: and it is certain that inoculation muft derive a great advantage, perhaps its principal one, from avoiding the concurrences above-mentioned.

It has commonly been fuppofed, that inoculation derives fome advantage from the choice of the matter employed in it; but it is very doubtful if any choice

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be here neceſſary, or can be of any benefit in determining the ſtate of the diſeaſe. It is not indeed probable that there is any difference of contagion producing the ſmall-pox; for there are innumerable inſtances of the contagion ariſing from a perſon who labours under the diſtinct ſmall-pox producing the confluent kind, and the contrary. Since the practice of inoculation hath been introduced, it has alſo been obſerved, that the ſame variolous matter would in one perſon produce the diſtinct and in another the confluent ſmall-pox. It is therefore highly probable, that the difference of the ſmall-pox does not much depend upon any difference of the contagion, but upon ſome difference in the ſtate of the perſons to whom it is applied, or in the ſtate of certain circumſtances concurring with the application of the contagion.

Some have ſuppoſed, that inoculation has an advantage over the natural infection, by introducing only a ſmall portion of contagious matter into the body; but this is by no means well aſcertained. It is not known what quantity of contagion is introduced into the body by the common infection of the ſmall-pox; and it is probable the quantity is not great: nor, though it were larger than that thrown in by inoculation, is it certain what the effects would be. A certain quantity of ferment may be neceſſary to excite fermentation in a given maſs; but when that quantity is given, the fermentation and aſſimilation are extended to the whole maſs; and we do not find that a greater quantity than is juſt neceſſary, either increaſes the activity of the fermentation, or more certainly ſecures the aſſimilation of the whole. In the caſe of the ſmall-pox, a conſiderable difference in the quantity of the contagion introduced hath not ſhown any effects in modifying the diſeaſe.

Purging has the effect of diminiſhing the activity of the ſanguiferous ſyſtem, and of obviating the inflammatory ſtate of it; and therefore it is probable, that the frequent uſe of cooling purgatives gives a conſiderable advantage to the practice of inoculation; and probably this is alſo obtained by diminiſhing the determination to the ſkin. It ſeems alſo probable, that mercurials and antimonials are uſeful only as they make part of the purging courſe.

It is probable that the ſtate of the ſmall-pox depends very much upon the ſtate of the eruptive fever, and particularly in avoiding the inflammatory ſtate of the ſkin; and therefore it is alſo probable, that the meaſures taken for moderating the eruptive fever, and inflammatory ſtate of the ſkin, are the greateſt improvement which has been made in the practice of inoculation. The tendency of purging, and the uſe of acids to this purpoſe, is ſufficiently obvious: and upon the ſame grounds we ſhould ſuppoſe that blood-letting might be uſeful; but probably this has been omitted, and perhaps other remedies might be ſo, ſince we have found a more powerful and effectual one in the application of cold air and the uſe of cold drink.

It hath been the practice of inoculators to continue the uſe of purgatives and the application of cold air after the eruption; but it cannot be ſaid to give any particular advantages to inoculation, and the employment of purgatives ſeems often to have led to an abuſe. When the ſtate of the eruption is determined, when the number of puſtules is very ſmall, and the fever has entirely ceaſed, the ſafety of the diſeaſe may be ſaid to be aſcertained, and further remedies abſolutely ſuperfluous: in ſuch caſes therefore the uſe of purgatives is unneceſſary, and may be hurtful.

It remains now only to conſider the treatment of the ſmall-pox, when the ſymptoms are violent, as may ſometimes happen, even after inoculation and every remedy and precaution have been uſed. The cauſe of this is not aſcertained, but it ſeems to be a putreſcent tendency of the fluids. When therefore, from the prevailing of ſmall-pox as an epidemic, and more eſpecially when it is known that a perſon not formerly affected with the diſeaſe has been expoſed to the infection, if ſuch perſon ſhould be attacked with the ſymptoms of fever, there can be little doubt that it is the fever of the ſmall-pox, and therefore he is to be treated in every reſpect as if he had received the diſeaſe by inoculation. He is to be freely expoſed to cool air, to be purged, and to have cooling acids given liberally. If theſe meaſures moderate the fever, nothing more is neceſſary: but if the nature of the fever be uncertain; or if, with ſuſpicions of the ſmall-pox, the fever be violent; or even if, knowing the diſtemper to be the ſmall-pox, the meaſures above-mentioned do not moderate the fever ſufficiently; veneſection will be proper; and more eſpecially if the perſon be an adult, of a plethoric habit, and accuſtomed to full living. In the ſame circumſtances it will always be proper to give a vomit; which is uſeful in the beginning of all fevers, and eſpecially in this, where a determination to the ſtomach appears by pain and ſpontaneous vomiting.

It frequently happens, eſpecially in infants, that, during the eruptive fever of the ſmall-pox, convulſions occur. Of theſe, if only one or two fits appear on the evening preceding the eruption, they give a prognoſtic of a mild diſeaſe, and require no remedy: but if they occur more early, are violent, and frequently repeated, they are very dangerous, and require a ſpeedy remedy; and here bleeding and bliſtering are of no ſervice, the only effectual medicine is an opiate given in a large doſe.

Theſe are the remedies neceſſary during the eruptive fever; and if, upon the eruption, the puſtules on the face are diſtinct, and their number few, the diſeaſe requires no further remedies. But when, upon the eruption, the number of pimples on the face is conſiderable, when they are not diſtinct; and eſpecially if, upon the fifth day, the fever does not ſuffer a conſiderable remiſſion; the diſeaſe ſtill requires a great deal of attention.

If, after the eruption, the fever ſhall ſtill continue, the avoiding of heat and the continuing to expoſe the body to a cool air will ſtill be proper. If the fever be conſiderable, with a full hard pulſe, in an adult perſon, a bleeding will be neceſſary, and more certainly a cooling purgative: but it will be ſeldom neceſſary to repeat the bleeding, as a loſs of ſtrength very ſoon comes on; but the repetition of a purgative, or the frequent uſe of laxative glyſters, is commonly advantageous.

When a loſs of ſtrength, with other marks of a putreſcent tendency of the fluids, appears, the Peruvian bark muſt be given in ſubſtance, and in large quantity.

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quantity. In the same case, the use of acids and of nitre is advantageous, and commonly it is proper also to give wine very freely. From the fifth day of the disease throughout the whole course of it, it is proper to give an opiate once or twice a-day; taking care at the same time to obviate costiveness, by purgatives or by laxative glysters. From the eighth to the eleventh day of a violent disease, it will be proper to lay on blisters successively on different parts of the body, and that without regard to the parts being covered with pustules. Blisters are also to be applied to the external fauces, in case of difficult deglutition, and viscid saliva and mucus, which are thrown out with difficulty, at the same time that detergent gargles are to be diligently used. During the whole course of this disease, when a considerable fever is present, antimonial medicines, in nauseating doses, have by some been alleged to be employed with advantage; and in this way they have often the effect of moving the belly. But the great distress which patients suffer from a state of constant nausea is hardly to be borne; and every advantage which can be had from this practice may be obtained by easier means.

The remedies above-mentioned are frequently proper from the fifth day till the suppuration be finished. But after that period the fever is sometimes continued and increased; or sometimes, when there was little or no fever before, a fever now arises and continues with considerable danger; this is called the *secondary fever*, and requires a particular treatment.

When the secondary fever follows the distinct small-pox, and the pulse is full and hard, the case is to be treated as an inflammatory affection, by bleeding and purging; but the secondary fever which follows the confluent kind is to be considered as a putrid disease, and bleeding is improper. Some purging may be necessary, but the remedies to be chiefly depended upon are the Peruvian bark and acids. When the secondary fever first appears, whether after a distinct or confluent small-pox, it is useful to exhibit an antimonial emetic in nauseating doses, but in such a manner as to produce some vomiting. For avoiding the pits which frequently follow the small-pox, no method hitherto proposed seems to be sufficiently certain.

On the subject of inoculation, Baron Dimsdale, a very celebrated writer, informs us, that were it left to his choice, he would decline inoculating children under two years old; because within that period they are exposed to all the dangers of dentition, fevers, fluxes, convulsions, and other accidents, sufficiently difficult in themselves to manage in such tender subjects.

In regard to constitution, Baron Dimsdale observes, that greater liberties may be taken than were formerly judged admissible. Persons afflicted with various chronic complaints, of scrophulous, scorbutic, and arthritic habits; persons of unwieldy corpulency, and of intemperate, irregular lives; have all passed through this disease with as much facility as the most temperate, healthy, and regular. But those who labour under any acute or critical disease, or its effects, are obviously unfit and improper subjects. So likewise are those in whom are evident marks of corrosive acrimonious humours, or who have an evident debility of the whole frame from inanition or any other cause. All such require to be treated in a particular manner pre-

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vious to the introduction of this disease. Constitutions disposed to frequent returns of intermittents, seem likewise justly exceptionable; especially as the preparatory regimen may in some habits increase this tendency. Baron Dimsdale, however, has known instances of severe ague-fits attacking persons between the insertion of the matter and the eruption of the small-pox, and even during maturation, when the Peruvian bark has been given liberally and with much success; the principal business, in the mean time, suffering no injury or interruption

Among the circumstances generally considered as more or less propitious to inoculation, the season of the year has been reckoned a matter of some importance. Spring and autumn have been generally recommended, as being the most temperate seasons; the cold of winter and the summer-heats having been judged unfavourable for this purpose But Baron Dimsdale remarks, that experience does not justify those opinions; for, according to the best observation he has been able to make, inoculated persons have generally had more pustules in spring than at any other time of the year; and epidemic diseases being commonly most frequent in autumn, especially fluxes, intermittents, and ulcerated sore throats (all which are liable to mix more or less with the small-pox), the autumn, upon this account, does not seem to be the most favourable season in general.

Baron Dimsdale's opinion is, that considering the surprising and indisputable benefits arising at all times to patients in the small-pox, from the free admission of fresh cool air and evacuations, we may safely inoculate at all seasons, provided care be taken to screen the patients as much as possible from heat in summer, and to prevent them from keeping themselves too warm and too much shut up, as they are naturally disposed to do, from the weather in winter. When seasons, however, are marked with any peculiar epidemics, of such a kind especially as may render a mild disease more untractable, it may perhaps be most prudent not to inoculate while such diseases are prevalent.

In directing the preparatory regimen, Baron Dimsdale principally aims at the following points, viz. To reduce the patient, if in high health, to a lower and more secure state; to strengthen the constitution, if too low; to correct what appears vitiated; and to clear the stomach and bowels, as much as may be, from all crudities and their effects. With this view he orders such of his patients as constitute the first class above-mentioned, and who are by much the majority, to live in the following manner: To abstain from all animal food, including broths, and likewise butter and cheese; from all fermented liquors, excepting small beer, which is allowed sparingly; and from all spices, and whatever is endued with a manifest heating quality. The diet is to consist of pudding, gruel, sago, milk, rice-milk, fruit-pyes, greens, roots, and vegetables of any of the kinds in season, prepared or raw. Eggs, though not to be eaten alone, are allowed in puddings, and butter in pye-crust. The patients are to be careful that they do not eat such a quantity as to overload their stomachs, even of this kind of food. Tea, coffee, or chocolate, are permitted for breakfast, to those who choose or are accustomed to them.

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In this manner they are to proceed about nine or ten days before the operation; during which period, at nearly equal distances, they are directed to take three doses of the following powder, either made into pills or mixed with a little syrup or jelly, at bed-time, and a dose of Glauber's salts dissolved in thin water-gruel, each succeeding morning.

The powder is composed of eight grains of calomel, the same quantity of the compound powder of crab's-claws, and one eighth part of a grain of emetic tartar. Instead of the latter, Baron Dimsdale has sometimes substituted two grains of precipitated sulphur of antimony. In order to facilitate the division of the doses, a large quantity is prepared at once, and great care taken that the several ingredients be well mixed

This quantity is usually sufficient for a healthy strong man; and the dose must be lessened for women or children, according to their age and strength, as well as for persons advanced in years.

The first dose is generally ordered at the commencement of the course; the second, three or four days after; and the third about the eighth or ninth day. The Baron chooses to inoculate the day after the last dose has been taken. On the days of purging, broths are allowed, and the patients are desired to abstain from unprepared vegetables.

What has been said concerning the preparation, must be considered as proper only for the young or middle-aged, in a good state of health: but among those who are desirous of inoculation, are often found tender, delicate, and weakly women; men of bad stamina, valetudinarians by constitution, by illness, or intemperance; also aged persons, and children; and for all such a very different treatment must be directed. Here a milder course of medicine, rather of the alterative than purgative kind, is preferable; and in many instances, an indulgence in some light animal-food, with a glass or two of wine in case of lowness, is not only allowable, but necessary to support a proper degree of strength, especially in advanced age.

Children, whose bowels are often tender, and ought not be ruffled by strong purges, yet require a mild mercurial, and bear it well. Besides emptying the bowels of crudities, it is a good security against worms and their effects, which sometimes produce very alarming and even fatal disorders.

Inattention to the particular state of health of those who are entering upon the preparatory course, has been productive of great mischief. This is chiefly observable respecting the indiscreet use of mercurials, by which a salivation has often been raised, to the risk of impairing good constitutions, and the ruin of such as were previously weak and infirm. The distinctions and treatment necessary, will be obvious to those who are acquainted with the animal economy and medical practice.

The time of menstruation has generally been the guide in respect to the inoculation of women, that the whole of the disease may be over within the menstrual period. Baron Dimsdale informs us, that he observes this rule, when he can choose his time without any inconvenience, and he inoculates soon after the evacuation ceases; tho' he has no reason to decline performing the operation at any time.

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Women with child have likewise been inoculated, and done well; but the state of pregnancy seems unfavourable to the process, which ought therefore not to be hazarded without some urgent reason. Baron Dimsdale has not inoculated any woman whom he knew to be pregnant; but on some who concealed their pregnancy he has performed the operation, without producing a miscarriage; the hope of which event, he suspects, had rendered them desirous of the process. One of those had a child born nine weeks after inoculation, at the full time, with distinct marks of the disease, though the mother had very few pustules.

The manner most commonly practised in this country for communicating the small-pox by inoculation, has of late been the following: A thread was drawn through a ripe pustule, and well moistened with matter. A piece of this thread was insinuated into a superficial incision made in one or both arms, near the part where issues are usually fixed; and being covered with a plaster, was there left for a day or two.

Very different methods of inoculation, however, are pursued; two of which Baron Dimsdale has frequently practised and describes; but he informs us, that the following has proved so invariably successful, as to induce him to give it the preference.

The patient to be infected being in the same house, and, if no objection be made to it, in the same room, with one who has the disease, a little of the variolous matter is taken from the place of insertion, if the subject be under inoculation; or a pustule, if in the natural way, on the point of a lancet, so that both sides of the point are moistened.

With this lancet an incision is made in that part of the arm where issues are usually placed, deep enough to pass through the scarf-skin, and just to touch the skin itself; and in length as short as possible, not more than one eighth of an inch.

The little wound being then stretched open between the finger and thumb of the operator, the incision is moistened with the matter, by gently touching it with the flat side of the infected lancet. This operation is generally performed in both arms, and sometimes in two places in one arm, a little distant from each other. For as Baron Dimsdale has not observed any inconvenience from two or three incisions, he seldom trusts to one; that neither he nor his patient may be under any doubt about the success of the operation from its being performed in one place only.

Baron Dimsdale has also tried the following method, with the same success as that above described; but he does not so much approve of it, because he has been credibly informed that it has sometimes failed in the practice of others. A lancet being moistened with the variolous fluid in the same manner as in the other, is gently introduced, in an oblique manner, between the scarf and true skin, and the finger of the operator is applied on the point, in order to wipe off the infection from the lancet, when it is withdrawn. In this method, as well as in the former, a little blood will sometimes appear; but Baron Dimsdale neither draws blood with design, nor does he think there is any necessity of wiping it off before the matter is introduced.

In both these ways of inoculating, neither plaster, bandage, Exanthemata. Variola.

bandage, nor covering is applied, nor in any respect necessary.

Baron Dimsdale informs us, that those methods of producing this disease have never once failed him; and experience has sufficiently proved that there is no danger from additional infection by the natural disease at the same time. He therefore makes no scruple of having the person to be inoculated, and the person from whom the infection is to be taken, in the same room; nor has he ever observed any ill consequence attending this practice. But he advises the inoculated patients (though perhaps there be no necessity for that precaution) to be afterwards separated from places of infection till certain signs of success appear, when all restraint is removed, there being then no danger from accumulation.

Baron Dimsdale remarks, that it seems to be of no consequence whether the infecting matter be taken from the natural or inoculated small-pox. He has used both, and never has been able to discover the least difference, either respecting the certainty of infection, the progress, or the event. He therefore takes the infection from either, as opportunity offers, or at the option of the patients or their friends.

Neither is it of any consequence whether the matter be taken before, or at the crisis of, the distemper. It is generally supposed, that the small-pox is not infectious till after the matter has acquired a certain degree of maturity; and in the common method of inoculation this is so much attended to, that when the operation has proved ineffectual, the failure has been ascribed to the unripeness of the matter.

But, as the author remarks, it appears very clearly from the present practice of inoculation, that so soon as any moisture can be taken from the infected part of an inoculated patient, previous to the appearance of any pustules, and even previous to the eruptive fever, this moisture is capable of communicating the small-pox with the utmost certainty. Baron Dimsdale has taken a little clear fluid from the elevated pellicle on the incised part, even so early as the fourth day after the operation; and has at other times used matter fully digested at the crisis, with equal success. In general, however, he prefers taking the matter for infection during the eruptive fever, as he supposes it at that time to have its utmost activity.

In all cases, when he takes matter from an inoculated person, it is from the place where it was inserted; as he is always sure to find infection there if the disease succeeds, and always of sufficient energy.

It may appear strange that no bandage, dressing, or application whatsoever, is used to the part infected; but that the most simple incision being made, and moistened with the smallest particle of the recent fluid matter, the whole is committed to nature. This method, however, the Baron observes, is perfectly right: because the application of either plaster or unguent, as is the usual practice, will occasion an inflammation on some skins; and, in all, tend to disfigure the natural appearance of the incision, and prevent our forming a proper judgment of the progress of the infection.

If neither an inoculated patient be at hand, nor any one in the neighbourhood has a distinct kind of the natural disease, a thread may be used as in the common manner, provided it be very recently infected; but Baron Dimsdale is of opinion, that the thread ought to be used as soon as possible after being charged with the infecting matter.

The method of inoculation recommended by Baron Dimsdale is now almost universally adopted; or at least if any change has taken place, the operation is, if possible, still more simplified. Without the trouble of bringing to the same house both the person from whom the contagion is to be taken and the person to whom it is to be given, the operator in general carries the matter about with him on what is called a *reservoir lancet*. For this purpose a common lancet may be employed; but one, the blade of which is accurately inclosed in a metallic case, so constructed as to prevent the access of the air, and at the same time not to rub off the matter, is certainly preferable. The infectious matter on this lancet is gently moistened by holding it for a few seconds over the steam of warm water; and by rubbing on it the point of another lancet, as much is taken off as is sufficient for giving the disease, which is done by introducing this infected point under the scarf-skin, in the manner Baron Dimsdale has recommended. Where fresh matter can be had, it is always preferable: but where this cannot be obtained, a lancet may be infected from a dry pustule, though kept for many months, by moistening it in warm water; particularly if care has been taken to preserve it from the action of external air by keeping it in a close phial.

A due attention to the progress of infection, discoverable by the part where the operation was performed, is a necessary circumstance; because a just prognostic may thence be sometimes formed of the future state of the distemper, and indications may be taken from the different appearances on the arm, that will enable us to prevent inconveniences.

Baron Dimsdale observes, that the former method of covering the place of incision with a plaster, and continuing upon it dressings of one sort or other, prevented much useful information of this kind. They precluded any judgment by the touch, and sometimes rendered that by the eye equivocal.

The day after the operation is performed, though it takes effect, little alteration is discoverable. On the second day, if the part be viewed with a lens, there generally appears a kind of orange-coloured stain about the incision, and the surrounding skin seems to contract. At this time Baron Dimsdale usually gives the following medicine at going to bed, either mixed with a little of any kind of jelly, or more frequently made into a pill.

Calomel, and compound powder of crab's-claws, of each three grains; emetic tartar, one-tenth of a grain.

A quantity of this medicine should be carefully prepared at once, in order to make the division more exact.

On the fourth or fifth day, upon applying the finger, a hardness is perceptible to the touch. The patient feels an itching on the part, which appears slightly inflamed; and under a kind of vesication is seen a little clear fluid, the part resembling a superficial burn. About the sixth, most commonly some pain and stiffness is felt in the axilla; a circumstance which not only foretels the near approach of the eruptive symptoms, but

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but is a ſign of a favourable progreſs of the diſeaſe. Sometimes on the ſeventh, oftener on the eighth day, ſymptoms of the eruptive fever appear; ſuch as ſlight remitting pains in the head and back, ſucceeded by tranſient ſhiverings and alternate heats, which continue in a greater or leſs degree till the eruption be perfected. At this time alſo it is uſual for the patient to complain of a very diſagreeable taſte in his mouth, the breath is always fetid, and there enſues a ſmell peculiar to the variolous eruptive fever.

The inflammation in the arms at this time ſpreads faſt; and, upon viewing it with a good glaſs, the inciſion for the moſt part appears ſurrounded with an infinite number of ſmall confluent puſtules, which increaſe in ſize and extent as the diſeaſe advances. On the tenth or eleventh day, a circular or oval efflorefcence is uſually diſcovered ſurrounding the inciſion, and extending ſometimes near half round the arm, but more frequently to about the ſize of a ſhilling; and being under the cuticle, is ſmooth to the touch and not painful. This appearance alſo is favourable. It accompanies eruption; every diſagreeable ſymptom ceaſes; and at the ſame time it certainly indicates the whole affair to be over, the pain and ſtiffneſs in the axilla alſo going off.

The feveriſh ſymptoms are for the moſt part ſo mild, as ſeldom to require any aſſiſtance, except a repetition of the ſame medicine that was directed on the ſecond night after the operation; and next morning the following laxative draught ſhould be given, to procure three or four ſtools.

Infuſion of ſenna two ounces, manna half an ounce, tincture of jalap two drachms.

Theſe are given as ſoon as the eruptive ſymptoms are perceivable, if they ſeem to indicate any uncommon degree of vehemence.

It has been obſerved, that by attending to the progreſs of infection, we may in general be able to prognoſticate with ſome degree of certainty the iſſue of the diſtemper. Particular incidents will ever happen, but not ſufficient to invalidate the propriety of general rules.

If the appearances already deſcribed are obſerved early, a very favourable event may be expected; but it happens in ſome caſes, that the ſucceſs of the inoculation is barely perceptible, the colour about the wound remaining pale, inſtead of changing to red or inflamed; the edges of the inciſion ſpread but little, they remain almoſt entirely flat, and are attended neither with itching nor uneaſineſs of any kind. Nay, ſometimes on the fifth, and even the ſixth day, the alteration is ſo little as to render it doubtful whether the infection has taken place.

When matters are in this ſtate, Baron Dimſdale obſerves the appearance is unfavourable, implying a late and more untoward diſeaſe: To prevent which, he directs the powder or pill to be taken every night; and in caſe it fails to operate by ſtool, or there be the leaſt diſpoſition to coſtiveneſs, an ounce of Glauber's ſalts, or more commonly the laxative draught already mentioned, is given in the morning, once or twice, as the caſe may require. This courſe forwards the inflammation, which is always a deſirable circumſtance; it being in general obſerved, that an early progreſs on the arm, and an early commencement of the eruptive complaints, portend that the diſtemper will be mild and favourable; and on the contrary, when both are late, the ſymptoms he tells us are uſually more irregular and unfavourable.

Further experience, however, has by no means fully confirmed his opinion in this particular. On the contrary, even where the progreſs of infection in the arm has been uncommonly ſlow, a diſeaſe in the mildeſt poſſible form has ſucceeded. There is therefore no good reaſon why a practitioner ſhould be alarmed at an uncommonly ſlow progreſs, or ſhould in ſuch inſtances employ more internal remedies than he would do in other caſes. And ſome, whoſe practice in inoculation has been very extenſive, have even remarked, that when infants are inoculated, they have never obſerved epileptic acceſſions, the moſt alarming forerunners of the diſeaſe, in thoſe caſes where the progreſs of the arm has been ſlow.

The management recommended by Baron Dimſdale at the period of eruption differing eſſentially from that of former practitioners, and being a matter of great importance, he gives the following explicit directions on this head, adviſing that they may be purſued with firmneſs and moderation.

Inſtead of the patient being confined to his bed or his room, when the ſymptoms of the eruptive fever come on, he is directed, as ſoon as the purging medicine has operated, to keep abroad, as much as he can bear, in the open air, be it ever ſo cold; always taking care not to ſtand ſtill, but to walk about moderately while abroad. He is alſo directed, if thirſty, to drink cold water.

Baron Dimſdale obſerves, that this treatment ſeems as hard at firſt to the patients as it muſt appear ſingular to thoſe who are unacquainted with ſuch practice; but the effects are ſo ſalutary, ſo conſtantly confirmed by experience, and an eaſy progreſs through every ſtage of the diſeaſe depends ſo much upon it, that he admits of no exception, unleſs the weather be extremely ſevere and the conſtitution very delicate. He adds, it is indiſputably true, that, in the few inſtances where the ſymptoms of eruption have run very high, the patients being averſe to any motion, and fearing the cold as the greateſt evil; yet when, under thoſe circumſtances, he has perſuaded them to riſe out of bed, and go out of doors, though led ſometimes by two aſſiſtants, and has allowed them to drink as much cold water as they choſe, they have not ſuffered the leaſt unfavourable accident: on the contrary, after they have been prevailed upon to comply with thoſe directions, they find their ſpirits revived; an inclination for nouriſhment returns; they reſt well; a gentle ſweat ſucceeds, accompanied with a favourable eruption; and the fever ſeems to be entirely extinguiſhed.

Cool regimen during the eruptive fever is now almoſt univerſally adopted; but like other uſeful remedies it has not unfrequently been abuſed: And practitioners ought never to forget, that inoculated patients are not, more than the reſt of the human ſpecies, exempted from injuries from cold, which is unqueſtionably a powerful cauſe of diſeaſe. Unleſs, therefore, in caſes where very conſiderable morbid heat is induced by the eruptive fever, by which a temporary defence is unqueſtionably afforded againſt the action of external

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external cold, the bad effects which may result from it are never to be overlooked. And there is even reason to believe, as may indeed be inferred from Baron Dimsdale's observations, that the disease is more moderated by the action of pure and free air than by cold. Accordingly inoculation is performed with very great success even in the warmest seasons and situations of warm climates.

In general, the complaints in this state are very moderate, and attended with so little illness that the patient eats and sleeps well the whole time. A few pustules appear, sometimes equally disposed; sometimes the inflammations on the arms spread, and are surrounded with a few pustules, which gradually advance to maturity; during which time, for the most part, the eruption proceeds kindly, and there is much more difficulty to restrain the patients within due bounds, and prevent their mixing with the public, thereby spreading the infection, than there was at first to prevail upon them to go abroad. During this time medicine is seldom wanted; the coolest air seems the best cordial; and if any uncommon languor happens, a bason of small broth, or a glass of wine, is allowed in the day, or some white-wine whey at bed-time; which are indeed at any time allowed to tender, aged, or weakly persons.

With these exceptions, the patients are hitherto kept very scrupulously to the diet at first directed. But after the eruption is completed, they are, if occasion requires, indulged in a little well-boiled meat of the lightest kind, as chicken, veal, or mutton.

The above-mentioned regimen, the cooling alterative purges, and the free use of cool air at the season of eruption, almost universally prevent either alarming symptoms or a large crop of pustules. Baron Dimsdale has seen a few with such a quantity of pustules, though distinct, that he has neither advised nor allowed them to go out of the house. But the generality of his patients, when the eruptions are few, amuse themselves abroad, within proper limits, with the pustules upon them.

This practice, however, the Baron neither enjoins nor maintains to be necessary; but he has not been able to observe that any inconvenience has arisen from it. He also informs us, that, how strange soever it may appear, those who are most adventurous, seem to enjoy better spirits, and are more free from complaints, than others who are inclined to keep within doors.

Those who have the disease in the slightest manner first described, viz. without any appearance of eruption but on the inoculated part, are soon permitted to go about their usual affairs: and many instances have happened of very industrious poor men, who have immediately returned to their daily labour, with a caution not to intermix with those who have not had the distemper, for fear of spreading it; and with injunctions to take, two or three times, of the purge already directed, or as many doses of Glauber's salts. Those who have the disease in a greater degree, are confined somewhat longer; and, if there be the least disposition to costiveness, a very mild laxative is now and then exhibited; as the progress to maturation appears rather to be advanced than retarded by such means.

When the maturation is completed, and there is nothing farther to fear from the distemper, Baron Dimsdale allows his patients gradually to change their course of diet, from the perfectly cooling kind, to one a little more generous; recommending strictly to all a return to their ordinary animal-diet, with much caution and restraint upon their appetites, both in respect of food and fermented liquors.

He observes it is not often that we are under the necessity of making any application to the part where the insertion of the variolous matter was made. It most commonly heals up, and is covered with a scab, about the time when, in a natural way, all the small-pox would have been dried up. But in some cases the incisions continue to discharge a purulent matter a longer time. In these instances it is sufficient to cover the part with the white cerate, or any other mild emplastic substance, which may at once prevent the linen from adhering to the sore, and defend it from the air. As in these cases the part remains unhealed from some peculiar cause in the habit, it will be necessary to give gentle purgatives, and proper alteratives, as particular exigencies may require.

After describing the usual progress of the small-pox from inoculation, Baron Dimsdale remarks that there are frequent deviations from this course, which may embarrass an unexperienced practitioner, and create a real difficulty, as well as apprehensions of danger. He therefore proceeds to relate the means for removing those symptoms, and the doubts respecting the event.

The symptom he first notices, and which, though it very rarely happens, sometimes gives much trouble, is great sickness, accompanied with vomiting, in the eruptive state of the disease. For this complaint it is always necessary in the first place to clear the stomach; which may be effected, either by ordering the patient to drink plentifully of warm liquids to promote vomiting; or perhaps more properly, by giving to an adult one grain of tartarised antimony, mixed with ten grains of compound powder of crab's-claws; taking care to diminish the dose for very young and weak subjects.

This usually throws off some bilious matter by vomit, sometimes procures stools, or occasions a moderate sweat, and generally administers relief. If, however, no stools should follow from this medicine, and the sickness should remain, a gentle laxative almost certainly procures a respite, and the appearance of the eruption entirely removes the complaint.

Another deviation, of yet greater consequence, which sometimes happens towards the time of the eruption, and is often, though not always, accompanied with great sickness, is an erysipelatous efflorescence. If this shows itself on the skin partially, and here and there in patches, it is not very alarming, and soon wears off. But sometimes the whole surface of the body is covered with a rash intimately mixed with the variolous eruption, and so much resembling the most malignant kind of confluent small-pox as scarcely to be distinguished from it. In some such cases, accompanied with petechiæ and livid spots, Baron Dimsdale has been much alarmed; not being able by inspection only, though assisted by glasses, to determine whether what he saw was an inoffensive rash, or tokens of the greatest malignity. Very strict attention, however, has

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enabled him to diſtinguiſh the difference clearly; and for aſſiſting others in ſuch a diſcrimination, he makes the following remarks.

The real and eſſential difference is to be gathered from the concomitant ſymptoms. In the eryſipelatous or variolous raſh, there is not ſo much fever, nor is the reſtleſſneſs or pain of the head or loins ſo conſiderable, neither is there that general proſtration of ſtrength; all which are uſual attendants on a confluent ſmall-pox, eſpecially when accompanied with ſuch putrid appearances. Beſides, upon a careful examination, there may ſometimes be diſcerned a few diſtinct puſtules, larger than the reſt, mixed with the raſh, which are the real ſmall-pox. In thoſe caſes the patients are ordered to refrain from cold water, or any thing cold; and to keep within doors, but not in bed. If any ſickneſs yet remains, a little white-wine whey, or other temperate cordial, is adviſed; and this method has been ſo generally ſucceſsful, as to prevent any alarming complaint. After two or three days, the ſkin changes from a florid to a duſky colour, a few diſtinct puſtules remain, and advance properly to maturation, without any farther trouble enſuing from this formidable appearance.

This raſh has often been miſtaken for the confluence it ſo much reſembles; and has afforded occaſion for ſome practitioners, either ignorantly or diſingenuouſly, to pretend, that, after a very copious eruption of the confluent pox, they can by a ſpecific medicine diſcharge the greater part of the puſtules, leaving only as many diſtinct ones as may ſatisfy the patient that he has the diſeaſe.

Baron Dimſdale informs us, that raſhes of the kind above deſcribed frequently happen during the preparation (whether owing to the regimen, or medicine, or both, he does not determine), and cauſe the operation to be poſtponed. But he has obſerved, that in ſuch caſes they are apt to return at the time of the eruption of the ſmall-pox.

In general, as has been already ſaid, the ſymptoms which precede eruption commence at the end of the ſeventh or on the eighth day incluſive from the operation; but it often happens that they appear much ſooner, and ſometimes much later than this period. Baron Dimſdale has ſeen ſome caſes in which the diſeaſe has come on ſo ſuddenly after infection, and with ſo little complaint or uneaſineſs, that the whole affair has been terminated, purges taken, and the patient returned home perfectly well, in a week; before others, inoculated at the ſame time, from the ſame patient, and under the ſame circumſtances, have begun to complain.

In this caſe, the inoculated part ſhows early certain marks of infection, ſometimes on the very next day, or the day after, when the inciſion will often appear conſiderably inflamed and elevated. The patient about this time frequently makes ſome of the following complaints, viz. chillneſs, itchings, and ſlight pricking pains in the part, and ſometimes on the ſhoulder; giddineſs, drowzineſs, and a ſlight head-ach, ſometimes attended with a feveriſh heat, but often without any. The account which patients themſelves give of their feelings is, in ſome, as if they had drank too much, and in others, as if they had caught a cold. Thoſe complaints ſeldom laſt 24 hours, often not ſo long, and with frequent intermiſſions; never, ſo far as our author remembers, riſing to a degree that requires confinement. During the continuance of thoſe complaints, the inflammation of the arm advances apace, and feels hard to the touch; but upon their wearing off, the inflamed appearances gradually diminiſh, and the part dries to a common ſmall ſcab; the ſkin, that was before red, turns livid, and the diſeaſe entirely vaniſhes. In ſome inſtances, thoſe ſymptoms attack much later; even on the ſeventh or eighth day, when an eruption might be expected in conſequence of them, yet none appears; but the arm gets well very ſoon, and the diſeaſe is at an end.

In this irregular ſort of the diſorder there have, however, been ſome examples where a few eruptions have appeared, and probably in conſequence of the inoculation: yet the puſtules have not looked like the true ſmall-pox, neither have they maturated like them, nor laſted longer than three days; about which time, for the moſt part, they have dried away.

When this irregular kind of the diſeaſe firſt occurred in Baron Dimſdale's practice, he was in doubt whether the patients were quite ſecure from any future attacks of the diſtemper. In order to be ſatisfied of this point, he inoculated them a ſecond time, cauſing them to aſſociate with perſons in every ſtage of the diſeaſe, and to try all other means of catching the infection. This method has been practiſed with the generality of ſuch patients ever ſince, yet without a ſingle inſtance of its producing any diſorder. Baron Dimſdale, therefore, now makes no ſcruple of pronouncing them perfectly ſafe; and experience has enabled him to foretel, for the moſt part, in two or three days after the operation, whether the diſeaſe will paſs in this ſlight manner.

Upon the ſecond inoculation, however, the inciſed parts are uncommonly inflamed for a day or two, juſt in the ſame manner as has in numerous inſtances been obſerved, as well in thoſe who, though certain of having had the ſmall-pox in the natural way, have ſubmitted to inoculation for the ſake of experiment, as in others, who, being doubtful whether they have had the diſeaſe or not, have been inoculated in order to be ſatisfied. But in all ſuch caſes, the parts ſoon became well; nor did any of thoſe appearances which have been deſcribed as the conſtant attendants on inoculation, as pain in the head, giddineſs, marks of infection in the arm, &c. enſue. Neither can thoſe appearances ever be produced upon a perſon who has had the ſmall-pox before, either in the natural way or by inoculation.

Another irregularity deſerving notice is, that ſometimes upon the abatement of the fever and other ſymptoms, after the appearance of ſeveral puſtules, and when the eruptive ſtage of the diſeaſe ſeems completed, it nevertheleſs happens that freſh eruptions come out, and continue doing ſo daily, for four, five, or even ſix days ſucceſſively; preceded ſometimes by a ſlight pain in the head, though more frequently they appear without any new diſturbance. Thoſe are generally few, of ſhort duration, and ſeldom come to maturity. Baron Dimſdale, however, has ſeen four caſes, in which, after a ceſſation of complaints, and an appearance of few puſtules, the eruptive ſtage of the diſeaſe was thought to be over, yet in two or three days a-

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a fresh fit of fever has attacked the patients, and after a short illness a quantity of new pustules has broke out far exceeding the first number, and those remained and matured completely.

Some of the Baron's own patients, and, as he has been credibly informed, those of other inoculators, have had considerable eruptions of this kind after they returned home; which have probably given occasion for the reports of several having had the disease in the natural way after inoculation. But in confirmation that those reports are ill-grounded, he observes, that in all the cases of this sort which have occurred in his own practice, or, as far as he can learn, in that of others, the second or latter crop of pustules has always happened within the time usually allowed for the progress of the small-pox from inoculation; before the inflammation on the arm has ceased, and sooner than we can suppose them to have been produced by infection received in the natural way. When this has happened, it has been to persons in whom, after a slight eruption and abatement of symptoms, the disease has prematurely been judged to be quite over, and they have therefore been permitted to return to their families.

An appearance, more alarming and more dangerous than any of those which have already been taken notice of, is the occurrence of epileptic fits. For although it has been remarked, that these are often the forerunners of a mild disease, both in cases of accidental and likewise of intentional contagion; yet it is undeniable, that in not a few instances they have of themselves proved fatal. Wherever, therefore, an epileptic fit occurs, it naturally claims the attention of the practitioner. The occurrence of future fits is best prevented by the employment of tincture of opium, taking off the tendency to inordinate action by giving at least a temporary diminution of irritability; and on the same principle, when during a fit the patient is able to swallow, nothing is more effectual either in shortening the fit or diminishing its severity, than a dose of laudanum accommodated to the age and condition of the patient. Considerable benefit may be derived from any volatile alkaline spirit, such as spirit of hartshorn, the favourite remedy of Dr Sydenham in such cases. But the best effects may be obtained from the use of the tepid bath, which is not only of service in such cases from its action as an antispasmodic, but which also, by producing relaxation of the skin, facilitates and promotes the eruption. And even allowing that, as some imagine, the number of pustules should be increased by heat applied in this manner; yet much less is to be dreaded from thence than from the continuance of the fits.

Baron Dimsdale next considers the consequences that arise from this very cool and repelling method, and how far the patient's future state of health may be affected by a practice so opposite to what was formerly employed.

It has been the general opinion, that in most or all eruptive complaints, especially the small-pox, the rational method of cure was to forward, by every gentle means, the efforts of nature in producing an eruption; and on the contrary, that there was danger in checking it, either by cold air, cold drink, or any considerable evacuations. For this purpose the use of warm diluents, and the lying in bed, especially if the fever and symptoms run high, or at least confining to the house, have been generally approved and recommended. Experience, however, has now sufficiently confirmed the advantage of a different kind of treatment.

While the old methods prevailed of conducting inoculation, the patients, particularly children, after passing through the disease in a very favourable manner, were frequently liable to abscesses in the axilla and other parts, tedious ophthalmies, and troublesome ulcerations in the place of insertion; which though they could not be foreseen nor prevented, yet often gave more pain and vexation to the patients, and trouble to the operator, than the disease itself had done. But on inquiry into the state of those who have been treated in the cool way, or according to the new method, Baron Dimsdale affirms, that in more than 1500 there has been only one who has had so much as a boil in the axilla; and this was a child who had in the same arm an issue, which was at that time dried up. He has seen only two very small superficial boils in others near the place of insertion; and those seemed to be occasioned rather by an irritation from the discharge than by any other cause, and were all soon healed with very little trouble.

In a few instances also, there has been a slough in the incised part, which has caused a sore of short duration; but not one instance of an ulcer of any continuance. Such little breakings out too, and scabs, as frequently succeed the mild natural small-pox, sometimes, though rarely, happen to those inoculated in the new way; and, as they are of little consequence, are generally cured by the same method, the use of a few gentle purges.

In regard to ophthalmies from this kind of practice, Baron Dimsdale has never known an instance of one truly deserving that name The coats of the eye have been a little inflamed in a very few, but they soon became clear, without any means used for that purpose. He knows but two cases where he thought the inflammation great enough to require bleeding; and not one where a blister was necessary. Those complaints, therefore, which were formerly so frequent and troublesome, seem to be much reduced by the new method, the great utility of which is now universally acknowledged.

When the benefits of inoculation have now been demonstrated to be so great, it is truly surprising that the practice has not yet become general. Even its wonderful success, however, particularly when contrasted with the natural small-pox, has not been sufficient to remove every prejudice against it; and in many parts of Britain, the lower class are deterred from it by scruples even of a religious nature, by which means the state annually sustains a very considerable loss. It is, however, but just to observe, that in many parts both the medical practitioners and the clergy have done all in their power to remove every difficulty. At Edinburgh, the colleges of physicians and surgeons annually make an offer of their assistance and advice *gratis* to all the poor who submit to this operation during certain months; and a most respectable clergyman has been at the expence of publishing a plain and sensible discourse, not only calculated to remove every religious doubt or scruple which can be entertained on

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this head, but alfo clearly demonftrating to parents, that they have themfelves to blame for the death of their children if they neglect to employ the means with which Providence has furnifhed them for preferving the lives of their offspring.

226 Genus XXIX. VARICELLA.

Chicken-pox.

Varicella, *Vog.* 42.
Variola lymphatica, *Sauv.* fp. 1.
Anglis, *The Chicken pox*, Edin. Med. Effays, vol. ii. art. 2. near the end. *Heberden*, Med. Tranfac. art. 17.

This is in general a very flight difeafe; and is attended with fo little danger, that it would not merit any notice, if it were not apt to be confounded with the fmall-pox, and thus give occafion to an opinion that a perfon might have the fmall-pox twice in his life; or they are apt to deceive into a falfe fecurity thofe who have never had the fmall-pox, and make them believe that they are fafe when in reality they are not. This eruption breaks out in many, according to Dr Heberden, without any illnefs or previous fign; in others it is preceded by a little degree of chillnefs, laffitude, cough, broken fleep, wandering pains, lofs of appetite, and feverifh ftate for three days.

In fome patients the chicken-pox make their firft appearance on the back; but this perhaps is not conftant. Moft of them are of the common fize of the fmall-pox, but fome are lefs. Dr Heberden never faw them confluent, nor very numerous. The greateft number was about 12 in the face, and 200 over the reft of the body.

On the firft day of the eruption they are reddifh. On the fecond day there is at the top of moft of them a very fmall bladder, about the fize of a millet-feed. This is fometimes full of a watery and colourlefs, fometimes of a yellowifh liquor, contained between the cuticle and fkin. On the fecond, or, at the fartheft, on the third day from the beginning of the eruption, as many of thefe pocks as are not broken feem arrived at their full maturity; and thofe which are fulleft of that yellow liquor very much refemble what the genuine fmall-pox are on the fifth or fixth day, efpecially where there happens to be a larger fpace than ordinary occupied by the extravafated ferum. It happens to moft of them, either on the firft day that this little bladder arifes, or on the day after, that its tender cuticle is burft by the accidental rubbing of the clothes, or by the patient's hands to allay the itching which attends this eruption. A thin fcab is then formed at the top of the pock, and the fwelling of the other part abates, without its ever being turned into pus, as it is in the fmall-pox. Some few efcape being burft; and the little drop of liquor contained in the veficle at the top of them, grows yellow and thick, and dries into a fcab. On the fifth day of the eruption they are almoft all dried and covered with a flight cruft. The inflammation of thefe pocks is very fmall, and the contents of them do not feem to be owing to fuppuration, as in the fmall-pox, but rather to what is extravafated under the cuticle by the ferous veffels of the fkin, as in a common blifter. No wonder, therefore, that this liquor appears fo foon as on the fecond day; and that, upon the cuticle being broken, it is prefently fucceeded by a flight fcab: hence too, as the true fkin is fo little affected, no mark or fcar is likely to be left, unlefs in one or two pocks, where, either by being accidentally much fretted, or by fome extraordinary fharpnefs of the contents, a little ulcer is formed in the fkin. Varicella.

The patients fcarce fuffer any thing throughout the whole progrefs of this illnefs, except fome languidnefs of ftrength and fpirits and appetite; all which is probably owing to the confining of themfelves to their chamber.

Two children were taken ill of the chicken-pox, whofe mother chofe to be with them, though fhe had never had this illnefs. Upon the eighth or ninth day after the pocks were at their height in the children, the mother fell ill of this diftemper then beginning to fhow itfelf. In this inftance the infection lay in the body much about the fame time that it is known to do in the fmall-pox.

Remedies are not likely to be much wanted in a difeafe attended with hardly any inconvenience, and which in fo fhort a time is certainly cured of itfelf.

The principal marks by which the chicken-pox may be diftinguifhed from the fmall-pox are,

1. The appearance, on the fecond or third day from the eruption, of that veficle full of ferum upon the top of the pock.

2. The cruft, which covers the pocks on the fifth day; at which time thofe of the fmall-pox are not at the height of their fuppuration.

Foreign medical writers hardly ever mention the name of this diftemper: and the writers of our own country fcarce mention any thing more of it than its name. Morton fpeaks of it as if he fuppofed it to be a very mild genuine fmall-pox. But thefe two diftempers are furely totally different from one another, not only on account of their different appearances abovementioned, but becaufe thofe who have had the fmall-pox are capable of being infected with the chicken-pox; but thofe who have once had the chicken-pox are not capable of having it again, though to fuch as have never had this diftemper, it feems as infectious as the fmall-pox. Dr Heberden wetted a thread in the moft concocted pus-like liquor of the chicken-pox which he could find; and after making a flight incifion, it was confined upon the arm of one who had formerly had it; the little wound healed up immediately, and fhowed no figns of any infection.

From the great fimilitude between the two diftempers, it is probable, that, inftead of the fmall-pox, fome perfons have been inoculated from the chicken-pox; and that the diftemper which has fucceeded, has been miftaken for the fmall-pox by hafty or unexperienced obfervers.

There is fometimes feen an eruption, concerning which Dr Heberden is in doubt whether it be one of the many unnoticed cutaneous difeafes, or only a more malignant fort of chicken-pox.

This diforder is preceded for three or four days by all the fymptoms which forerun the chicken-pox; but in a much higher degree. On the fourth or fifth day the eruption appears, with very little abatement of the fever: the pains likewife of the limbs and back ftill continue, to which are joined pains of the gums. The pocks

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pocks are redder than the chicken-pox, and spread wider; and hardly rise so high, at least not in proportion to their size. Instead of one little head or vesicle of a serous matter, these have from four to ten or twelve. They go off just like the chicken-pox, and are distinguishable from the small-pox by the same marks; besides which, the continuance of the pains and fever after the eruption, and the degree of both these, though there be not above 20 pocks, are circumstances never happening in the small-pox.

227 Genus XXX. RUBEOLA.
Measles.

Rubeola, *Sauv.* gen. 94. *Lin.* 4. *Sag.* 293.
Febris morbillosa, *Vog.* 36. *Hoffm.* II. 62.
Morbilli, *Junck.* 76.

Sp. I. The *Regular* Measles.

Rubeola vulgaris, *Sauv.* sp. 1.
Morbilli regulares, *Sydenh.* Sect. iv. cap. 5.

Var. 1. The *Anomalous* Measles.

Rubeola anomala, *Sauv.* sp. 2.
Morbilli anomali, *Sydenh.* sect. v. cap. 3.

Var. 2. The Measles attended with *Quinsy*.

Var. 3. The Measles with *Putrid Diathesis* of the Blood.

228 Sp. II. The Variolodes.
In Scotland commonly called the *Nirles*.

Rubeola variolodes, *Sauv.* sp. 3.

Description. This disease begins with a cold stage, which is soon followed by a hot, with the ordinary symptoms of thirst, anorexia, anxiety, sickness, and vomiting; and these are more or less considerable in different cases. Sometimes from the beginning the fever is sharp and violent: often, for the first two days, it is obscure and inconsiderable; but always becomes violent before the eruption, which commonly happens on the fourth day. This eruptive fever, from the beginning of it, is always attended with hoarseness, a frequent hoarse dry cough, and often with some difficulty of breathing. At the same time, the eye-lids are somewhat swelled; the eyes are a little inflamed, and pour out tears; and with this there is a coryza, and frequent sneezing. For the most part, a constant drowsiness attends the beginning of this disease. The eruption, as we have said, commonly appears upon the fourth day, first on the face, and successively on the lower parts of the body. It appears first in small red points; but, soon after, a number of these appear in clusters, which do not arise in visible pimples, but, by the touch, are found to be a little prominent. This is the case on the face; but, in other parts of the body, the prominency, or roughness, is hardly to be perceived. On the face, the eruption retains its redness, or has it increased for two days; but on the third, the vivid redness is changed to a brownish red; and in a day or two more the eruption entirely disappears, while a mealy desquamation takes place. During the whole time of the eruption, the face is somewhat turgid, but seldom considerably swelled. Sometimes, after the eruption has appeared, the fever ceases entirely: but this is seldom the case; and more commonly the fever continues or is increased after the eruption, and does not cease till after the desquamation. Even then the fever does not always cease, but continues with various duration and effect. Though the fever happen to cease upon the eruption's taking place, it is common for the cough to continue till after the desquamation, and sometimes much longer. In all cases, while the fever continues, the cough also continues, generally with an increase of the difficulty of breathing; and both of these symptoms sometimes arise to a degree which denotes a pneumonic affection. This may happen at any period of the disease; but very often it does not come on till after the desquamation of the eruption.

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After the same period, also, a diarrhœa frequently comes on, and continues for some time.

It is common for measles, even when they have not been of a violent kind, to be followed by inflammatory affections, particularly ophthalmia and phthisis. If blood be drawn from a vein in the measles, with circumstances necessary to favour the separation of the gluten, this always appears separated, and lying on the surface of the crassamentum, as in inflammatory diseases. For the most part, the measles, even when violent, are without any putrid tendency; but in some cases, such a tendency appears both in the course of the disease, and especially after the ordinary course of it is finished.

Causes. The measles are occasioned by a peculiar kind of contagion, the nature of which is not understood; and which, like that of the small-pox, affects a person only once in his life.

Prognosis. From the description of this distemper already given, it appears that the measles are attended with a catarrhal affection, and with an inflammatory diathesis to a considerable degree; and therefore the danger of them is to be apprehended chiefly from the coming on of a pneumonic inflammation.

Cure. In measles, as well as in small-pox, the disease from its nature must necessarily run a determined course; and therefore the sole aim of a practitioner is to conduct this course in the easiest manner, by preventing and obviating urgent symptoms.

From the consideration mentioned in the prognosis, it will be obvious, that the remedies especially necessary are those which may obviate and diminish the inflammatory diathesis; and therefore, in a particular manner, blood-letting. This remedy may be employed at any time in the course of the disease, or after the ordinary course of it is finished. It is to be employed more or less, according to the urgency of the symptoms of fever, cough, and dyspnœa; and generally may be employed very freely. But as the symptoms of pneumonic inflammation seldom come on during the eruptive fever, and as this is sometimes violent immediately before the eruption, though a sufficiently mild disease be to follow; bleeding is seldom very necessary during the eruptive fever, and may often be reserved for the times of greater danger which are perhaps to follow.

In all cases of measles, where there are no marks of putrescency, and where there is no reason, from the known nature of the epidemic, to apprehend putrescency, bleeding is the remedy most to be depended upon:

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upon: but affiftance may alfo be drawn from cooling purgatives; and particularly from bliftering on the fides or between the fhoulders. The dry cough may be alleviated by the large ufe of demulcent pectorals, mucilaginous, oily, or fweet. It may, however, be obferved, with refpect to thefe demulcents, that they are not fo powerful in involving and correcting the acrimony of the mafs of blood as has been imagined; and that their chief operation is by befmearing the fauces, and thereby defending them from the irritation of acrids, either arifing from the lungs or diftilling from the head. For moderating and quieting the cough in this difeafe, opiates certainly prove the moft effectual means, whenever they can be fafely employed. In the meafles, in which an inflammatory ftate prevails in a confiderable degree, opiates have indeed by fome been fuppofed to be inadmiffible: but experience abundantly demonftrates, that the objection made to their ufe is merely hypothetical; and even in cafes where, from a high degree of pyrexia and of dyfpnœa, there is reafon to fear the prefence, or at leaft the danger, of pneumonic inflammation, opiates are highly ufeful; after bleeding, to obviate or abate the inflammatory ftate, has been duly employed: in fuch cafes, while the cough and watchfulnefs are the urgent fymptoms, opiates may be fafely exhibited, and with great advantage. In all the exanthemata, there is an acrimony diffufed over the fyftem, which gives a confiderable irritation; and, for obviating the effects of this, opiates are ufeful, and always proper, when no particular contra-indication prevails.

When the defquamation of the meafles is finifhed, though then there fhould be no diforder remaining, phyficians have thought it neceffary to purge the patient feveral times, with a view to draw off what have been called the *dregs of this difeafe*; that is, a portion of the morbific matter which is fuppofed to remain long in the body. Dr Cullen does not reject this fuppofition; but at the fame time cannot believe that the remains of the morbific matter, diffufed over the whole mafs of blood, can be wholly drawn off by purging; and therefore thinks, that, to avoid the confequence of the meafles, it is not the drawing off the morbific matter which we need to ftudy, fo much as to obviate and remove the inflammatory ftate of the fyftem which had been induced by the difeafe. With this laft view indeed, purging may ftill be a proper remedy; but bleeding, in proportion to the fymptoms of inflammatory difpofition, is ftill more fo.

From our late experience of the ufe of cold air in the eruptive fever of the fmall-pox, fome phyficians have been of opinion that the practice may be transferred to the meafles; but this point has not yet been determined by fufficiently extenfive experience. We are certain, that external heat may be very hurtful in the meafles, as in moft other inflammatory difeafes; and therefore, that the body ought to be kept in a moderate temperature during the whole courfe of the difeafe: but how far, at any period of the difeafe, cold air may be applied with fafety, is ftill uncertain. Analogy, though fo often the refource of phyficians, is frequently fallacious; and further, though the analogy with the fmall-pox might lead to the application of cold air during the eruptive fever of the meafles, the analogy with catarrh feems to be againft the practice.

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When the eruption is upon the fkin, there are many inftances of cold air making it difappear, and thereby producing much diforder in the fyftem; and there are alfo frequent inftances of this diforder's being removed by reftoring the heat of the body, and thereby again bringing out the eruption.

Upwards of 20 years ago, inoculation for the meafles was propofed, and practifed in feveral inftances with fuccefs, by Dr Home of Edinburgh. His method of communicating the infection was, by applying to an incifion in each arm cotton moiftened with the blood of a patient labouring under the meafles; but with others who have made fimilar trials, the attempt has not yet fucceeded. And attempts have been made to inoculate this difeafe by means of the fluid difcharged under the form of tears, the fquamæ falling from the furface, and the like; but there is reafon to believe, that where it was imagined the infection had thus been communicated, the contagion was only carried about the perfon inoculating, and communicated in the ordinary way.

From inoculation of the meafles, it is imagined that feveral advantages may be obtained; and among others, it is thought the forenefs of the eyes may be mitigated, the cough abated, and the fever rendered lefs fevere. But the practice was never much in fafhion, and now is fcarce ever heard of.

Genus XXXI. MILIARIA. 229
The Miliary Fever.

Miliaria, *Lin.* 7.
Miliaris, *Sauv.* gen. 95. *Sag.* gen. 295.
Febris miliaris, *Vog.* 37.
Febris purpurata rubra et alba miliaris, *Hoffm.* II. 68.
Febris purpurea feu miliaris, *Junk.* 75.
Germanis der Friefel. *God. Welfch*, Hift. Med. de novo puerperarum morbo, qui der *Friefel* dicitur, Lipf. 1655.
Hamilton, de febr. miliar. 1710. *Fantonus*, de febr. mil. 1747. *Allioni* de miliar. 1758. *Fordyce*, de febr. mil. 1748. *Fifcher*, de febr. mil. 1767. *De Haen*, de divif. febr. 1760, et in Ration. med. paffim. *Matt. Collin* ad *Baldinger* de miliar. 1764.
Miliaris benigna, *Sauv.* fp. 1.
Miliaris maligna, *Sauv.* fp. 2.
Miliaris recidivans, *Sauv.* fp. 3.
Miliaris Germanica, *Sauv.* fp. 5.
Miliaris Boia, *Sauv.* fp. *a.*
Miliaris Britannica, *Sauv.* fp *i.*
Miliaris nova febris, *Sydenh.* Sched. monit. *Sauv.* fp. *d.*
Miliaris fudatoria, *Sauv.* fp. *e.*
Miliaris nautica, *Sauv.* fp. *g.*
Miliaris purpurata, *Sauv.* fp. *h.*
Miliaris lactea, *Sauv.* fp. *c.*
Miliaris puerperarum, *Sauv.* fp. *k.*
Miliaris fcorbutica, *Sauv.* fp. *l.*
Miliaris critica, *Sauv.* fp. *b.*

Hiftory and Defcription. This difeafe is faid to have been unknown to the ancients, and that it appeared for the firft time in Saxony about the middle of the laft century. It is faid to have fince fpread from thence into all the other countries of Europe; and, fince the period mentioned, to have appeared in many

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many countries in which it had never appeared before.

From the time of its having been first taken notice of, it has been described and treated of by many different writers; and by all of them, till very lately, has been considered as a peculiar idiopathic disease. It is said to have been constantly attended with peculiar symptoms. It comes on with a cold stage, which is often considerable. The hot stage, which follows, is attended with great anxiety, and frequent sighing. The heat of the body becomes great, and soon produces profuse sweating, preceded, however, with a sense of pricking, as of pin-points in the skin; and the sweat is of a peculiar rank and disagreeable odour. The eruption appears sooner or later in different persons, but at no determined period of the disease. It seldom or never appears upon the face; but appears first upon the neck and breast, and from thence often spreads over the whole body.

The eruption named *miliary* is said to be of two kinds; the one named the *red*, the other the *white miliary*. The former, which in English is strictly named a *rush*, is commonly allowed to be a symptomatic affection; and as the latter is the only one that has any pretensions to be considered as an idiopathic disease, it is this only that we shall more particularly describe and treat of under this genus.

What is then called the *white miliary eruption*, appears at first like the red, in very small red pimples, for the most part distinct, but sometimes clustered together. Their little prominence is better distinguished by the finger than by the eye. Soon after the appearance of this eruption, and, at least, on the second day, a small vesicle appears upon the top of the pimples. At first the vesicle is whey-coloured; but soon becomes white, and stands out like a little globule on the top of the pimple. In two or three days, these globules break, or are rubbed off; and are succeeded by small crusts, which soon after fall off in small scales. While one set of pimples take this course, another set arise to run the same; so that the disease often continues upon the skin for many days together. Sometimes when one crop of this eruption has disappeared, another, after some interval, is produced. And it has been further observed, that in some persons there is such a disposition to this disease, that they have been affected with it several times in the course of their lives.

This disease is said to affect both sexes, and persons of all ages and constitutions; but it has been observed at all times to affect especially, and most frequently, lying-in women.

It is often accompanied with violent symptoms, and has frequently proved fatal. The symptoms, however, attending it are very various; and they are, upon occasions, every one attending febrile diseases; but no symptom, or concourse of symptoms, are steadily the same in different persons, so as to give any specific character to the disease. When the disease is violent, the most common symptoms are phrenetic, comatose, and convulsive affections, which are also symptoms of all fevers treated by a very warm regimen.

While there is such a variety of symptoms appearing in this disease, it is not to be expected that any one particular method of cure can be proposed; and, accordingly, we find in different writers different methods and remedies prescribed; frequent disputes about the most proper; and those received and practised by some, opposed and deserted by others.

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It appears, however, to Dr Cullen, very improbable, that this was really a new disease, when it was first considered as such. There are very clear traces of it in authors who wrote long before that period; and though there were not, we know that ancient descriptions were often inaccurate and imperfect, particularly with respect to cutaneous affections; and we know also that those affections which commonly appeared as symptomatic only, were often neglected, or confounded together under a general appellation.

The antecedent symptoms of anxiety, sighing, and pricking of the skin, which have been spoken of as peculiar to this disease, are, however, common to many others; and perhaps to all those in which sweatings are forced out by a warm regimen. Of the symptoms said to be concomitant of this eruption, there are none which can be affirmed to be constant and peculiar but that of sweating. This, indeed, always precedes and accompanies the eruption; and, while the miliary eruption attends many different diseases, it never, however, appears in any of these but after sweating; and in persons labouring under the same diseases it does not appear, if in such persons sweating be avoided. It is therefore probable, that the eruption is the effect of sweating: and that it is the effect of a matter not before prevailing in the mass of blood, but generated under particular circumstances in the skin itself. That it depends upon particular circumstances of the skin, is also probable from its being observed that the eruption seldom or never appears upon the face, although it affects the whole of the body besides; and that it comes upon those places especially which are more closely covered; and that it can be brought out upon particular places by external applications.

It is to be observed, that this eruptive disease differs from the other exanthemata in many circumstances, especially the following; that it is not contagious, and therefore never epidemic; that the eruption appears at no determined period of the disease; that the eruption has no determined duration; that successive eruptions frequently appear in the course of the same fever, and that such eruptions frequently recur in the course of the same person's life. All this renders it very probable, that, in the miliary fever, the morbific matter is not a subsisting contagion communicated to the blood, and thence, in consequence of fever and assimilation, thrown out upon the surface of the body, but a matter occasionally produced in the skin itself by sweating.

This conclusion is further rendered probable from hence, that, while the miliary eruption has no symptoms or concourse of symptoms peculiar to itself, it, upon occasions, accompanies almost every febrile disease, whether inflammatory or putrid, if these happen to be attended with sweating; and from thence it may be presumed, that the miliary eruption is a symptomatic affection only, produced in the manner we have said.

But as this symptomatic affection does not always accompany every instance of sweating, it may be proper to inquire, what are the circumstances which especially

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cially determine this eruption to appear? And to this Dr Cullen gives no full and proper anſwer. He cannot ſay that there is any one circumſtance which in all caſes gives occaſion to this eruption; nor can he ſay what different cauſes, in different caſes, may give occaſion to it. There is only one obſervation that can be made to the purpoſe of this inquiry; and it is, that theſe perſons ſweating, under febrile diſeaſes, are eſpecially liable to the miliary eruption, who have been previouſly weakened by large evacuations, particularly of blood. This will explain why it happens to lying-in women more frequently than to any other perſons; and to confirm this explanation, he has obſerved, that the eruption has happened to other women, though not in child-bed, but who had been much ſubjected to a frequent and copious menſtruation, and to an almoſt conſtant *fluor albus*. He has alſo obſerved it to have happened to men in fevers, after wounds from which they had ſuffered a great loſs of blood.

Further, that this eruption is produced by a certain ſtate of debility, is, he thinks, probable, from its ſo often attending fevers of the putrid kind, which are always attended with great debility. It is true, that it alſo ſometimes attends inflammatory diſeaſes, when it cannot be accounted for in the ſame manner; but he believes it may be obſerved, that it eſpecially attends thoſe inflammatory diſeaſes in which the ſweats have been long protracted, or frequently repeated, and which have thereby produced a debility, and perhaps a debilitating putrid diatheſis.

That, however, the miliary eruption is not neceſſarily or even generally connected with a certain ſtate of debility, is abundantly evident from its being entirely wanting in by much the greater number of inſtances of typhoid fever, and in a variety of other diſeaſes where every poſſible degree of debility occurs: And that it is not connected with any certain ſtate of debility, ſtill farther appears, both from the condition of thoſe affected with it in different inſtances, which in point of ſtrength is very various; and likewiſe from the continuance of freſh eruptions with the ſame individual, although during that time in very different ſtates with reſpect to debility. It appears, therefore, much more probable, that it depends on ſome peculiar ſtate of the ſurface, induced by the concurring influence of certain prediſpoſing and occaſional cauſes.

It appears ſo clearly that this eruption is always a ſymptomatic and factitious affection, that Dr Cullen is perſuaded it may be, in moſt caſes, prevented merely by avoiding ſweats. Spontaneous ſweatings, in the beginning of diſeaſes, are very rarely critical; and all ſweatings not evidently critical, ſhould be prevented, or at leaſt moderated; and the promoting them, by increaſing external heat, is commonly very pernicious. Even critical ſweats ſhould hardly be encouraged by ſuch means. If, therefore, ſpontaneous ſweats ariſe, they are to be checked by the coolneſs of the chamber; by the lightneſs and looſeneſs of the bed-cloaths; by the perſons laying out their arms and hands; and by their taking cold drink: and in this way Dr Cullen thinks he has frequently prevented miliary eruptions, which were otherwiſe likely to have appeared, particularly in puerperal women.

But it may happen, when theſe precautions have been neglected, or from other circumſtances, that a miliary eruption does actually appear; and the queſtion will then be put, how the caſe is to be treated? This is a queſtion of conſequence; as there is reaſon to believe that the matter here generated is often of a virulent kind; it is often the offspring of putreſcency; and, when treated by increaſing the external heat of the body, it ſeems to acquire a virulence which produces thoſe ſymptoms mentioned above, and proves certainly fatal.

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It has been an unhappy opinion with moſt phyſicians, that eruptive diſeaſes were ready to be hurt by cold; and that it was therefore neceſſary to cover up the body very cloſely, and thereby increaſe the external heat. We now know that this is a miſtaken opinion; that increaſing the external heat of the body is very generally miſchievous; and that ſeveral eruptions not only admit, but require the application of cold air. Dr Cullen is perſuaded, therefore, that the practice which formerly prevailed in the caſe of miliary eruptions, of covering up the body cloſely, and both by external means and internal remedies encouraging the ſweatings which accompany this eruption, was highly pernicious, and commonly fatal. He is therefore of opinion, that even when a miliary eruption has appeared, in all caſes in which the ſweating is not manifeſtly critical, we ſhould employ all the means of ſtopping the ſweating that are mentioned above; and he has ſometimes had occaſion to obſerve, that even the admiſſion of cool air was ſafe and uſeful.

This is, in general, the treatment of miliary eruptions: but at the ſame time, the remedies ſuited to the primary diſeaſe are to be employed; and therefore, when the eruption happens to accompany inflammatory affections, and the fulneſs and hardneſs of the pulſe or other ſymptoms ſhow an inflammatory ſtate preſent, the caſe is to be treated by blood-letting, purging, and other antiphlogiſtic remedies.

Upon the other hand, when the miliary eruption attends diſeaſes, in which debility and putreſcency prevail, it will be proper to avoid all evacuations, and to employ tonic and antiſeptic remedies, particularly the Peruvian bark, cold drink, and cold air.

The moſt diſtreſſing circumſtance attending this affection, is the almoſt unſupportable ſickneſs at ſtomach which frequently occurs, and which is often obſerved to precede freſh eruptions taking place during the courſe of the diſeaſe. With the view of counteracting and alleviating this ſymptom, recourſe is had to wine and other cordial medicines. But with many patients nothing is found to have ſo much influence as the uſe of camphor, particularly when introduced gradually in ſmall doſes, under the form of the *miſtura camphorata* of the London pharmacopœia, or of the *emulſio camphorata* of that of Edinburgh.

We ſhall conclude this ſubject with obſerving, that the venerable octogenarian practitioner, de Fiſcher, when treating of this ſubject, in laying down the indications of cure, has given this as one of them: "Excretionis periphericæ non primariam habere rationem."

GENUS XXXII. SCARLATINA. 230
SCARLET FEVER.

Scarlatina, *Sauv.* gen. 98. *Vog.* 39. *Sag.* 294. *Junck.* 75.

Sp. I.

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Scarlatina.

Sp. I. The Mild Scarlet Fever.

Scarlatina febris, *Sauv.* ſp. 1. *Sydenham*, ſect. vi. cap. 2.

Sp. II. The Scarlet Fever with *Ulcerated Sore Throat.*

Scarlatina anginoſa. *Withering* on the Scarlet Fever.

The mild ſcarlet fever is deſcribed by Sydenham, who tells us that he can ſcarce account it a diſeaſe; and indeed nothing more ſeems to be neceſſary in the treatment of it than an antiphlogiſtic regimen, avoiding the application of cold air and cold drink. The diſeaſe however ſometimes rages epidemically, and is attended with very alarming ſymptoms, bearing no ſmall reſemblance to the cynanche maligna, in which caſe it is called *ſcarlatina anginoſa.*—The beſt deſcription of this diſtemper has been publiſhed by Dr Withering in the year 1778. This diſeaſe made its appearance, we are told, at Birmingham and the neighbouring villages, about the middle of May 1778. It continued in all its force and frequency to the end of October; varying, however, in ſome of its ſymptoms, as the air grew colder. In the beginning of November it was rarely met with; but towards the middle of that month, when the air became warmer, it increaſed again, and in ſome meaſure reſumed thoſe appearances it poſſeſſed in the ſummer-months, but which it had loſt during the cold winds in October.

It affected children more than adults; but ſeldom occurred in the former under two years of age, or in the latter if they had paſſed their fiftieth year.

Deſcription. With various general ſymptoms of fever, the patient at firſt complains of a dejection of ſpirits, a ſlight ſoreneſs or rather ſtiffneſs in the neck, with a ſenſe of ſtraitneſs in the muſcles of the neck and ſhoulders, as if they were bound with cords. The ſecond day of the fever this ſoreneſs in the throat increaſes, and the patients find a difficulty in ſwallowing; but the difficulty ſeems leſs occaſioned by the pain excited in the attempt, or by the ſtraitneſs of the paſſage, than by an inability to throw the neceſſary muſcles in action. The ſkin feels hot and dry, but not hard; and the patients experience frequent, ſmall, pungent pains, as if touched with the point of a needle. The breath is hot and burning to the lips, and thirſt makes them wiſh to drink; but the tendency to ſickneſs, and the exertions neceſſary in deglutition, are ſo unpleaſant, that they ſeldom care to drink much at a time. They have much uneaſineſs alſo from want of reſt during the night. In the morning of the third day, the face, neck, and breaſt, appear redder than uſual: in a few hours this redneſs becomes univerſal; and increaſes to ſuch a degree of intenſity, that the face, body, and limbs, reſemble a boiled lobſter in colour, and are evidently ſwollen. Upon preſſure the redneſs vaniſhes, but ſoon returns again. The ſkin is ſmooth to the touch, nor is there the leaſt appearance of pimples or puſtules. The eyes and noſtrils partake more or leſs of the general redneſs; and in proportion to the intenſity of this colour in the eyes, the tendency to delirium prevails.

Things continue in nearly this ſtate for two or three days longer, when the intenſe ſcarlet gradually abates, a brown colour ſucceeds, and the ſkin becoming rough, peels off in ſmall ſcales. The tumefaction ſubſides at the ſame time, and the patients gradually recover their ſtrength and appetite.

During the whole courſe of the diſeaſe, the pulſe is quick, ſmall, and uncommonly feeble; the urine ſmall in quantity; the ſub-maxillary glands ſomewhat enlarged and painful to the touch. The velum pendulum palati, the uvula, the tonſils, and gullet, as far as the eye can reach, partake of the general redneſs and tumefaction; but although collections of thick mucus, greatly reſembling the ſpecks or ſloughs in the putrid ſore throat, ſometimes occur, yet thoſe are eaſily waſhed off, and real ulcerations of thoſe parts were never obſerved.

Theſe are the moſt uſual appearances of this diſorder; but it too frequently aſſumes a much more fatal form. In ſome children the delirium commences in a few hours after the firſt attack; the ſkin is intenſely hot; the ſcarlet colour appears on the firſt or ſecond day, and they die very early on the third. Others again, who ſurvive this rapid termination, inſtead of recovering, as is uſual, about the time the ſkin begins to get its natural colour, fall into a kind of lingering, and die at laſt in the courſe of ſix or eight weeks.

In adults, circular livid ſpots were frequently obſerved about the breaſt, knees, and elbows; alſo large blotches of red, and others of white intermixed, and often changing places.

In the month of October, when the air becomes colder, the ſcarlet colour of the ſkin was both leſs frequent and leſs permanent. Many patients had no appearance of it at all; whilſt others, eſpecially adults, had a few minute red pimples, crowned with white pellucid heads The inſide of the throat was conſiderably tumefied; its colour a dull red, ſometimes tending to a livid. The pulſe beat in general 130 or 140 ſtrokes in a minute; was ſmall, but hard, and ſometimes ſufficiently ſo to juſtify the opening of a vein; and the blood thus taken away, in every inſtance when cool, appeared ſizy, and the whole craſſamentum firm.

Happy would it be, Dr Withering obſerves, if the baneful influence of this diſorder terminated with the febrile ſymptoms. But in ten or fifteen days from the ceſſation of the fever, and when a complete recovery might be expected, another train of ſymptoms occur, which at laſt frequently terminate fatally. The patients, after a few days amendment, feel a ſomething that prevents their farther approach to health; an unaccountable languor and debility prevails, a ſtiffneſs in the limbs, an accelerated pulſe, diſturbed ſleep, diſreliſh to food, and a ſcarcity of urine. Theſe ſymptoms, we are told, are ſoon ſucceeded by ſwellings of a real dropſical nature, forming ſometimes an anaſarca, and on other occaſions an aſcites; and not unfrequently ſcarlatina has proved fatal, from ſupervening hydrothorax in conſequence of the effuſion of water into the cheſt. It is unneceſſary to remark, that when this happens, a fatal termination is more ſudden than from any other modification of dropſy.

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Dr Withering, after examining the accounts given of this diſeaſe by different authors, proceeds to the diagnoſis. It may be diſtinguiſhed, he obſerves, from the petechial fever, by the eruption in the latter appearing ſeldom before the fourth day, by the regularity and diſtinctneſs of the ſpots, and by its principally occupying the neck, the back, and the loins. On the other hand, in the ſcarlet fever, the eruption generally appears about the third day; conſiſts either of broad blotches, or elſe one continued redneſs, which ſpreads over the face and the whole body.

In the fever called *purpura*, the puſtules are prominent, keep their colour under preſſure, and never appear early in the diſeaſe; whereas in the ſcarlet fever, the eruption appears more early, is not prominent, but perfectly ſmooth to the touch, and becomes quite white under preſſure.

Although the *purple fever* and *ſcarlatina* may be connected by ſome general cauſe, yet our author takes occaſion to obſerve, that they cannot be mere modifications of the ſame eruption: for examples occur, he ſays, of the ſame perſon being firſt ſeized with one of theſe diſorders, and afterwards with the other; but he never met with an inſtance of the ſame perſon having the ſcarlet fever twice; and he believes it to be as great an improbability as a repetition of the ſmall-pox.

This diſorder is particularly diſtinguiſhed from the *meaſles*, we are told, by the want of that cough, watery eye, and running at the noſe, which are known to be the predominant ſymptoms in the early ſtate of the meaſles, but are never known to exiſt in the ſcarlatina.

From the *eryſipelas* this diſeaſe is diſtinguiſhable, by the limited ſeat of the former, together with its not being contagious.

The *ulcerated ſore throat*, however, is more difficult to diſtinguiſh from this diſeaſe than any other; and yet the diſtinction is a matter of the greateſt importance, as the method of treatment, according to Dr Withering, ought to be extremely different.—But although, in a number of circumſtances, theſe two diſeaſes bear a very great reſemblance, yet, with a little attention, the one may in general, he thinks, be diſtinguiſhed from the other. From Dr Fothergill's account of the ſore throat attended with ulcers, our author has made out the following characteriſtical circumſtances of the two diſeaſes, contraſted to one another.

	Scarlatina Anginoſa.	Angina Gangrenoſa.
Seaſon.	Summer . . Autumn.	Spring . . Winter.
Air.	Hot . . Dry.	Warm . . Moiſt.
Places.	High . . Dry . . . Gravelly.	Cloſe. . Low . . Damp. . Marſhy.
Subjects.	Vigorous. Both ſexes alike. . Robuſt in moſt danger. . . .	Delicate . . Women and female children. Robuſt adults not in danger.
Skin.	Full ſcarlet . . . . ſmooth . . If pimply, the pimples white at the top . . Always dry and hot.	Red tinge . . pimply. . The pimples redder than the interſtices . . bedewed with ſweat towards morning.
Eyes.	Shining, equable, intenſe redneſs, rarely watery.	Inflamed and watery, or ſunk and dead.
Throat.	In ſummer, tonſils, &c. little tumefied; no ſlough . . In autumn, more ſwelled. Integuments ſeparating . . Sloughs white.	Tonſils, &c. conſideraly. ſwelled and ulcerated . . . Sloughs dark brown.
Breath.	Very hot, but not fetid.	Offenſive to the patients and aſſiſtants.
Voice.	In ſummer, natural.	Flat and rattling.
Bowels.	Regular at the acceſſion.	Purging at the acceſſion.
Blood.	Buffy. . Firm.	Florid . . Tender.
Termination.	The 3d, 5th, 8th, or 11th day.	No ſtated period
Nature.	Inflammatory.	Putrid.

It is not pretended, Dr Withering remarks, that all the above contraſted ſymptoms will be met with in every caſe. It is enough, he obſerves, that ſome of them appear; and that if conjoined with the conſideration of the prevailing conſtitution, they enable us to direct that mode of treatment which will moſt contribute to the relief of the ſick.

But notwithſtanding the attention which Dr Withering has beſtowed upon this ſubject, we are ſtill inclined to think, that the diſeaſe which he has ſo accurately deſcribed under the title of *ſcarlatina anginoſa*, is in reality the ſame affection with the malignant ulcerous ſore throat of Huxham and Fothergill. During different epidemics, this diſeaſe, like ſmall-pox and meaſles in different ſeaſons, is conſiderably varied in its appearance. But ſtill there occurs ſuch a ſimilarity as clearly marks the ſameneſs of the affection. And indeed this, as in the caſe of the ſmall-pox, is abundantly demonſtrated, by infection from one contagion giving protection againſt ſucceeding ones, although the appearances be much varied. This has particularly appeared at Edinburgh, where the diſeaſe has of late prevailed as an epidemic on three different years, viz. 1774-5, 1782-3, and 1789-90. During the firſt of theſe, in the greater part of patients, the ſore throats were of a very gangrenous and malignant nature: during the ſecond, the diſeaſe more commonly appeared under the form of what might be called *ſimple ſcarlatina:* and during the third epidemic, the contagion was, if we may be allowed the expreſſion, of an intermediate nature. But it is farther to be remarked, that during every one of thoſe epidemics, when ſeveral children of a family were at the ſame time ſubjected to the infection, in one the diſeaſe would have been attended with almoſt all the ſymptoms mentioned in the column of *ſcarlatina anginoſa*, with reſpect to ſkin, eyes, throat, breath, bowels, termination of the affections, &c. In another, would have occurred all the ſymptoms with reſpect to thoſe particulars which he has mentioned under the column of *angina gangrenoſa*. While at the ſame time, in numberleſs inſtances, even in the ſame patient, the diſeaſe at its commencement has ſhown evident marks of an inflammatory, and at its termination of a putrid tendency. And there cannot be a doubt, that both the ſcarlatina

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anginosa, and angina gangrenosa, as described by Fothergill and Huxham, have occurred in every season and situation, and have affected persons of every age and constitution not before subjected to either disease.

Causes. Dr Withering affirms, that the immediate cause of this disease is a poison of a peculiar kind, communicable by contagion.

2. That this poison first takes possession of the mucous membrane lining the fauces and the nose; and either by its action upon the secretory glands, or upon the mucus itself, assimilates that mucus to its own nature.

3. That it is from this beginning, and from this only, that it spreads to the stomach, &c. and at length acts upon the system at large.

4. That its first action upon the nerves is of a sedative or debilitating nature.

5. That in consequence of certain laws of the nervous system, when the debilitating effects operate upon the sensorium commune, a reaction takes place; and that this reaction is, *cæteris paribus*, proportioned to the debilitating power.

6. That, in consequence of this reaction of the nervous system, the vibratory motion of the capillary blood-vessels dependent thereon is greatly increased; an unusually large quantity of blood is accumulated in those vessels; the heart and large blood-vessels are deprived of their customary proportion; and hence, though stimulated to more frequent contraction, the pulse must necessarily be feeble.

7. That as violent exertions are followed by debility, upon the cessation of the fever, the capillary vessels, which had acted with such unusual violence, are left in a state of extreme debility, and are long in recovering their tone; hence it is that so many patients afterwards become dropsical.

Dr Withering next proceeds to the consideration of the different remedies, which either are at present in common use or have been recommended as proper in this disease.

Cure. Blood-letting has been recommended by authors; but such was the state of the pulse in this disorder, at least during the summer-months, that it was not in any instance thought advisable to take away blood. In some cases, indeed, where the fiery redness of the eyes seemed to demand the use of leeches, they were had recourse to, but never with any advantage. In the harvest months, when the pulse was more firm, and when suffocation seemed to be threatened from the swelling in the fauces, blood-letting was sometimes advised; but still with less advantage than one would have expected in almost any other situation.

Vomiting.] This, our author observes, seems to be the remedy of nature; and he is surprised how it should have been omitted by several authors who have gone before him. Vomiting, he says, most amply fulfils the indications arising both from a consideration of the cause and of the effects; and a liberal use of the remedy he holds forth as the true foundation for successful practice in scarlet fever and sore throat. His common form of emetic is a combination of tartar emetic and ipecacuanha, given in pretty smart doses; and these are to be repeated at least once in 48 hours, and in the worst cases so often as twice in 24 hours.

Scarlatina.

Purging.] The action of purgatives is considered by Dr Withering as altogether repugnant to the curative indications in this disease: for the poisons, as formerly remarked, being received into the system by the fauces, the operation of a purge, instead of discharging it, can only promote its diffusion along the alimentary canal; and in fact, we are told, that when even a spontaneous purging supervenes in this disease, the patients sink so amazingly fast, that it is not within the reach of art to support them. When, however, a considerable quantity of acrid matter passing from the fauces into the stomach, makes its way to the rectum, a considerable degree of looseness often takes place. And although evacuations from the system in general by means of cathartics may be hurtful, yet patients often obtain great relief from a free discharge of this matter; and by discharging it, purgatives have the effect even of preventing an evacuation from the system, which would otherwise take place.

Sudorifics. Cordials. Alexipharmics.] None of these remedies were found beneficial. With respect to cordials, Dr Withering observes, that altho' they seem to be indicated by the great loss of strength and feeble pulse, yet the certain consequence of their use always was, an increase of restlessness, of the delirium, and of the heat.

Diuretics.] These were found very beneficial. The vegetable fixed alkali is recommended as the most proper article of this kind: a dram or two may be easily swallowed every 24 hours, by giving a small quantity in every thing the patient drinks. Diuretics, however, have been found principally serviceable by practitioners in general in those cases where the urine is observed to be scanty, and where dropsical symptoms have taken place.

Peruvian bark.] No medicine, we are told, ever had a fairer trial in any disease than the Peruvian bark had in this epidemic; for the feeble pulse, great prostration of strength, with here and there a livid spot, were thought to be such undeniable evidences of a putrid tendency, that the bark was poured down not with a sparing hand. But this was only at first; for these livid spots and the sloughs in the throat being found to be the effects of inflammation instead of putrefaction, and the bark instead of diminishing, rather increasing these symptoms, it was at last entirely laid aside by Dr Withering in his practice. But although Peruvian bark may not have been successful with a particular epidemic at a particular place; yet from the concurring testimony of many practitioners, it is very commonly found to be productive of good effects: And there is perhaps no remedy in which greater dependence is in general put, particularly in the advanced periods of the disease, where the fœtor is considerable.

Upon the same principles that the bark was prescribed, fixable air was at first likewise advised, but with no evident effects either one way or another. Dulcified acids were also had recourse to, but with no advantage.

Opiates.] These, although recommended by some authors

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authors for the removal of inquietude and watchfulnefs, yet in this epidemic, inftead of effecting thefe purpofes, always increafed the diftrefs of the patient.

Blifters.] In the fummer appearance of the difeafe, blifters were univerfally detrimental; they never failed to haften the delirium; and if the cafe was of the worft kind, they too often confirmed its fatal tendency. But although this may have been the cafe during the epidemic which Dr Withering defcribes, it has by no means been generally obferved. On the contrary, by the early application of blifters to the external fauces, both the glandular fwellings and likewife the difcharge from the mouth and fauces have been much diminifhed; and practitioners have believed, not without probable reafon, that the after affections of the throat were lefs confiderable than would otherwife have been the cafe. Dr Withering allows, that in the autumnal feafon, when the inflammation was lefs generally diffufed through the body, they were lefs detrimental; but he thinks that they did not here produce any beneficial effects.

Injected gargles of contrayerva decoction, fweetened with oxymel of fquills, &c. were found very beneficial in bringing always large quantities of vifcid ropy ftuff from the fauces.

The immerfion of the feet and legs in warm water, although it did no harm, yet did not either procure fleep or abate the delirium, as it frequently does in other kinds of fever.

As in fummer it was found difficult to keep the patients fufficiently cool, they were ordered to lie upon a matrefs inftead of a feather-bed; a free circulation of air was kept up; and where the patient's ftrength would admit of it, they were ordered frequently out of doors. Animal food and fermented liquors were denied them, and nothing allowed but tea, coffee, chocolate, milk and water, gruel, barley-water, and fuch articles.

With refpect to the dropfical diforder which fo frequently fucceeds to this complaint, it was never obferved, Dr Withering remarks, when the preceding fymptoms had been properly treated.

When called upon to patients in the dropfical ftate, he began his practice by a dofe of calomel at night, and a purgative in the morning. When a febrile pulfe attended the other fymptoms, emetics were ufeful, as well as the faline draughts and other neutral falts. When great debility, comatofe or peripneumonic fymptoms occurred, blifters were found very ferviceable: but when dropfical fymptoms were the principal caufe of complaint, fmall dofes of rhubarb and calomel were advifed; recourfe was alfo had to diluted folutions of fixed alkalies, fquills, Seltzer waters, and other diuretics.

When the urine flows freely, fteel and other tonics are recommended; together with gentle exercife, high-feafoned food, wine, and the wearing of flannel in contact with the fkin.

Dr Withering concludes his effay with an enumeration of feveral cafes, treated according to the principles above laid down. The fuccefsful termination of thefe cafes demonftrates the propriety of the practice which he has recommended; at leaft for the epidemic under the form in which it then appeared.

Urticaria.

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Genus XXXIII. URTICARIA, Nettle-rash.

Febris urticata, *Vog.* 40.
Uredo, *Lin.* 8.
Purpura urticata, *Junck.* 75.
Scarlatina urticata, *Sauv.* fp. 2.
Eryfipelatis fpecies altera, *Sydenham*, fect. vi. cap. 6.
Febris fcarlatina, et febris urticata, *Meyferey*, Mal. des armées, 291 et feq.

Defcription. This difeafe has its Englifh name from the refemblance of its eruption to that made by the ftinging of nettles. Thefe little elevations upon the fkin in the nettle-rafh often appear inftantaneoufly, efpecially if the fkin be rubbed or fcratched, and feldom ftay many hours in the fame place, and fometimes not many minutes. No part of the body is exempt from them; and where many of them rife together, and continue an hour or two, the parts are often confiderably fwelled; which particularly happens in the face, arms, and hands. Thefe eruptions will continue to infeft the fkin, fometimes in one place and fometimes in another, for one or two hours at a time, two or three times every day, or perhaps for the greateft part of the 24 hours.—In fome perfons they laft only a few days, in others many months; nay, fometimes the difeafe has lafted for years with very fhort intervals.

But though the eruption of the urticaria refembles, as already obferved, that produced by the ftinging of nettles, it is fometimes accompanied with long wheals, as if the part had been ftruck with a whip. Whatever be the fhape of thefe eminences, they always appear folid, without having any cavity or head containing either water or any other liquor: and this affords an eafy mark whereby this difeafe may be diftinguifhed from the itch. For it often happens, that the infufferable itching with which this eruption is attended, provokes the patient to fcratch the parts fo violently, that a fmall part of the cuticle on the top of thefe little tumors is rubbed off; a little fcab fucceeds; and, when the fwelling is gone down, there is left an appearance hardly to be diftinguifhed from the itch, but by the circumftance juft now mentioned. The nettle-rafh alfo further differs from the itch, in not being infectious.

Caufes, &c. Dr Heberden is inclined to afcribe this diftemper to fome mechanical caufe outwardly applied to the fkin. He obferves, that moft people fuffer in a fimilar manner from the real ftinging of nettles. Cowhage, or, as it is corruptly called, *cow-itch*, a fort of phafeolus, or French bean, the pod of which is covered over with a kind of down or hair, and the effect of which upon the fkin is much the fame as that of nettles; and almoft any hairs cut equally fhort, and fprinkled upon the fkin, whenever they happen to ftick in it, will make the part itch or fmart in fuch a manner as to give great uneafinefs; it is alfo a confiderable time before the fkin can be cleared of the finer ones, when once they are ftrewed upon it.

Reaumur, in the fourth memoir of his Hiftory of Infects, defcribes a fpecies of caterpillars to which be-long

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long a fort of hairs almoft invifible to the naked eye, which are eafily detached, and frequently float in the air round their neft, though it have not been at all difturbed. The touch of thefe hairs has a fimilar effect with the cow-itch; that is, they occafion intolerable itchings, with little bumps and rednefs, arifing fometimes to a flight inflammation. Thefe he found would continue four or five days, if the animal or the neft had been much handled; and though they had not been touched at all, yet, by only walking near their nefts, the fame effects would be brought on, but for a fhorter time. Thefe hairs affect the fkin in this manner by fticking in it, as he could perceive with a glafs of a great magnifying power; for with one of a fmall power they were not vifible. The uneafy fenfations caufed by thefe fmall wounds, not only, as he fays, laft feveral days, but move from one part of the body to another; fo that they will ceafe upon one wrift, and immediately begin on the other; from the wrift they will go to the fingers or the face, or even to the parts of the body which are covered. He fuppofes, that the motions of the body, when much of this fine down lies near or upon the fkin, may drive it from one part to another, or change what was lying there inoffenfively to a fituation fit to make it penetrate into the fkin. Neither cold water, nor oil, nor fpirit of wine, with which the parts affected were bathed, had any effect in removing the itching. He thinks the moft efficacious remedy which he tried for this complaint was, to rub the parts ftrongly with parfley, which inftantly leffened the fenfations, and after two or three hours, entirely freed the patient from them. It is alfo well known, that many fpecies of caterpillars, by only walking over the hands, will produce fomething like this effect on the parts which they touch, and undoubtedly from the fame caufe.

Dr Heberden afks, Is it impoffible that the nettle-rafh fhould arife from the fame caufes, or from others fimilar, which we mifs by looking too deeply for them in the blood and humours? Such (fays he) may have been its origin in fome inftances, where it has lafted only a few days; but where this affection has continued for fome years, in perfons who change their linen every day, and who bathe frequently all the time, it can hardly be afcribed to fuch an external caufe. He has obferved it frequently to arife from cantharides: but though it has continued many weeks after the removal of the blifter, yet it might be fufpected that this arofe from the fine fpiculæ of the cantharides fticking all this time about the fkin; it being cuftomary to ftrew much of the dry powder of the cantharides over the blifter-plafter, whence it may readily be carried to other parts of the body. But it is certain that fimilar effects will fometimes follow the internal ufe of wild valerian root, or the eating of fifh not fufficiently dreffed; mufcles, fhrimps, and even honey, and the kernels of fruits, will alfo fometimes produce fymptoms of a fimilar kind. But whatever be its caufe, Dr Heberden never faw any reafon to fuppofe that the nettle-rafh had in any way vitiated the humours to fuch a degree as to require the ufe of internal remedies; and if the itching could be certainly and expeditioufly allayed, there would be no occafion for any farther cure. He concludes this hiftory of the diforder with a cafe communicated to him by Dr Monfey, phyfician of Chelfea-college, and in which the difeafe appeared with uncommon violence.

Urticaria.

W. A. aged near 30, of a thin fpare habit, was feized with a diforder attended with fymptoms of a very uncommon kind. Whenever he went into the air, if the fun fhined bright, he was feized with a tickling of his flefh on thofe parts expofed to the fun: this tickling, by his continuing in the air, increafed to a violent itching, attended with great heat and pain; the fkin would then be almoft as red as vermilion, and thicken like leather; and this remained till he went out of the open air, and then abated in about 15 or 20 minutes. This happened only when the fun was above the horizon; at other times he was what he called *quite well*.—But it was not owing to the heat of the fun; for the fun in winter affected him full as much, if not more, and the heat of the fire had no fuch effect. Thus he was confined to the houfe for 10 years. He tried feveral hofpitals, and had advices from many phyficians, without the leaft abatement of his complaints. At laft it was agreed by a confultation of phyficians, that he fhould try dipping in falt-water; which he did at Yarmouth for 13 weeks, without any vifible amendment. One hot day, having pulled off his clothes and gone into the fea in the middle of the day, the heat diffufed itfelf fo violently all over his body, that, by the time he had put on his clothes, his eye-fight began to fail, and he was compelled to lie down upon the ground to fave himfelf from falling. The moment he lay down, the faintnefs went off: upon this he got up again; but had no fooner arifen, than he found himfelf in the former condition: he therefore lay down again, and immediately recovered. He continued alternately getting up and lying down, till the diforder began to be exhaufted, which was in about half an hour; and he was frequently obliged to have recourfe to the fame expedient.

Having at laft accidentally met with Dr Monfey, this phyfician queftioned him concerning the caufe of the diforder; but nothing could be gueffed at, excepting that the patient owned he had one winter lived entirely upon bullock's liver and porter, from inability to purchafe better victuals. A comrade lived with him at that time, on the fame provifions; and he alfo was affected in a fimilar manner, though in a lefs degree, and had recovered. This patient was then firft put upon a courfe of Dover's fweating powder without any effect, and afterwards tried a courfe of nitrous ones with the fame bad fuccefs. At laft Dr Monfey determined to try the effect of mercury, which happily proved effectual in removing this obftinate and uncommon diftemper. The patient began with taking five grains of calomel for three nights running, and a cathartic next morning. In this courfe he went on for near a fortnight, at the end of which he found himfelf very fenfibly relieved. This encouraged him to go on rather too boldly, by which means a flight falivation enfued; however, that went off foon, and in about fix weeks he was quite well.—Some time after, he was threatened with a return of his diforder; but this was effectually relieved by a dofe of calomel, which he had afterwards occafion to repeat for the fame reafon, and with the fame fuccefs;

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success; but at last the disorder seemed to be radically cured, by his having no further symptoms of a relapse.

Genus XXXIV. PEMPHIGUS.

232 Pemphigus, *Sauv.* gen. 93. *Sag.* 291.
Morta, *Lin.* 1.
Febris bullosa, *Vog.* 41.
Pemphigus major, *Sauv.* sp. 1.
Exanthemata serosa, *C. Pison.* Obs. 150.
Febris pemphygodes, *Ephem. Germ.* D. I. A. viii. Obs. 56.
Pemphigus castrensis, *Sauv.* sp. 2.
Febres syneches, cum vesiculis per pectus et collum sparsis, *Morton.* App. ad Exerc. II.
Pemphigus Helveticus, *Sauv.* sp. 3. *Langhans* in Act. Helvet. vol. ii. p. 260. et in *Beschreibuug* des Siementhals, Zurich 1753.

This is a very rare disease, insomuch that Dr Cullen declares he never saw it. He declines taking the descriptions of foreign physicians; we shall therefore content ourselves with giving an instance of this very uncommon distemper, as it was observed in the infirmary at Aberdeen, and was treated by the late Dr David Stuart, then physician to that hospital, who soon after published an account of it in the Edinburgh Medical Commentaries. A private soldier of the 73d regiment, aged eighteen years, formerly a pedlar, and naturally of a healthy constitution, was received into the hospital at Aberdeen on the 25th of April. About twenty days before that, he had been seized with the measles when in the country; and, in marching to town, on the second day of their eruption, he was exposed to cold; upon which they suddenly disappeared.

Having arrived at Aberdeen, he was quartered in a damp, ill-aired, under ground apartment. He then complained of sickness at stomach, great oppression about the præcordia, head-ach, lassitude, and weariness, on the least exertion; with stiffness and rigidity of his knees and other joints. The surgeon of the regiment visited him: he was purged, but with little benefit. About ten days before, he observed on the inside of his thighs a number of very small, distinct, red spots, a little elevated above the surface of the skin, and much resembling the first appearance of small-pox. This eruption gradually spread itself over his whole body, and the pustules continued every day to increase in size.

Upon being received into the hospital, he complained of head-ach, sickness at stomach, oppression about the præcordia, thirst, sore throat, with difficulty of swallowing; his tongue was foul, his skin felt hot and feverish; pulse from 110 to 120, rather depressed; belly costive; eyes dull and languid, but without delirium. The whole surface of his skin was interspersed with vesicles, or phlyctænæ, of the size of an ordinary walnut; many of them were larger, especially on the arms and breast. In the interstices, between the vesicles, the appearance of the skin was natural, nor was there any redness round their base; the distance from one to another was from half an inch to a handbreadth or more. In some places two or three were joined together, like the pustules in the confluent small-pox. A few vesicles had burst of themselves, and formed a whitish scab or crust. These were mostly on the neck and face; others showed a tolerably laudable pus. However, by far the greatest number were perfectly entire, turgid, and of a bluish colour. Upon opening them, it was evident that the cuticle elevated above the cutis, and distended with a thin, yellowish, semipellucid serum, formed this appearance. Nor was the surface of the cutis ulcerated or livid; but of a red florid colour, as when the cuticle is separated by a blister, or superficial burning. No other person laboured under a similar disease, either in the part of the country from which he came, or when he resided in Aberdeen.

Pemphigus.

This case was treated in the following manner. The largest of the vesicles were snipped, and dressed with *unguent. e lap. calaminari.* In the evening he was vomited with a solution of tartar emetic, given in small quantities and at intervals. This also procured two loose stools. And he was ordered for drink, water-gruel acidulated with lemon-juice.

"April 16. He still complained of sickness, some oppression about his breast, and sore throat; he had slept little during the night; his tongue was foul and blackish; his skin, however, was not so hot as the preceding day; his urine was high-coloured, but had the appearance of separation; his pulse 90, and soft; most of the sores on the trunk of the body looked clean. Others, particularly where the vesicles were confluent, seemed beginning to ulcerate, and to have a bluish sublivid appearance. They were dressed afresh with cerate, and he was ordered the following medicines:

R. Decoct. Cort. Peruvian. ℥vi. Vini rubr. Lusitan. ℥iii. M. Hujus mixturæ capiat ℥ß. tertia quaque hora.

"His acidulated drink was continued; and on account of the very offensive smell on approaching near him, some vinegar was placed in a bason before the bed, and sprinkled on the floor; and the room was kept properly aired.

"April 17. His sores looked tolerably clean, unless on his arms and thighs; where they were livid, a little ulcerated, and discharged a bloody ichor.

"His headach, sickness, &c. were mostly gone; his tongue was rather cleaner; pulse 68, and soft. As the decoction of the bark sat easily on his stomach, the following prescription was ordered:

R. Pulv. subtiliss. Cort. Peruv. ʒß. Vini rubri Lusitan. Aquæ fontan. āā ℥ss. M. ft. Haust. tertia quaque hora repetend.

The acidulated drink was continued, and fresh dressings applied to the sores.

"April 18. The little ulcers in his arms and thighs still discharged a bloody ichor, and looked ill; his other complaints were better; pulse 82. The bark had not nauseated him, and it was continued as well as his former drink.

"April 19. His sores looked much cleaner and better; the fever was gone, his pulse natural, and he had no complaint but weakness and a troublesome itching of the skin: The Peruvian bark, &c. were continued.

"April 20. Some of the ulcers still poured forth a bloody ichor; most of them, however, looked well, and had begun to heal—fever gone—medicines continued.

"From the 21st of April, he went on gaining strength, and his sores appeared to heal fast; he was desired to take

Exanthemata take only four doses every day; and by the 27th his sores, &c. were totally dried up—he had no complaint, and was dismissed cured."

Since the publication of this case of pemphigus by Dr Stuart, observations on this disease have been published by Dr Stephen Dickson of Dublin in the Transactions of the Royal Irish Academy. In these observations, an account is given of six different cases which Dr Dickson has had an opportunity of seeing. Judging from these, Dr Dickson thinks that Dr Cullen's definition of this disease requires correction; and that it ought to be defined, "a fever accompanied with the successive eruption, from different parts of the body, internal as well as external, of vesicles about the size of an almond, which become turgid with a faintly yellowish serum, and in three or four days subside."

From the cases which have fallen under Dr Dickson's observation, he concludes, that the disease varies considerably as to its mildness or malignity. In three of the cases which he has seen, the symptoms were extremely mild, but in the other three strong symptoms of putrescency were manifested, and the life of the patient was in great danger. With respect to the method of cure, he is of opinion, that the general symptoms of weakness, and tendency to putrefaction, obviously point out the proper treatment. Nourishment must be supplied, and the Peruvian bark and wine carefully administered; and when vesicles appear on internal parts, irritation must be guarded against by opiates, demulcents, and gentle laxatives.

Some additional observations on the subject of pemphigus have lately been published in the London Medical Journal by Mr Thomas Christie. From a case which Mr Christie describes, he is disposed to agree with Dr Dickson in thinking that sometimes at least pemphigus is not contagious. He remarks, however, that the pemphigus described by some foreign writers was extremely infectious; which he thinks this may lead to a division of the disease into the two species, the pemphigus simplex and complicatus; both of which, but especially the last, seem to vary much with respect to mildness and malignity.

Genus XXXV. APHTHA.
The Thrush.

233 Aphtha, *Sauv.* gen. 100. *Lin.* 9. *Sag.* 298. *Boerh.* 978. *Hoffm.* II. 478. *Junck.* 137.
Febris aphthosa, *Vog.* 44.

The only idiopathic species is the thrush to which infants are subject; (Aphtha lactucimen, *Sauv.* sp. 1.)

The aphthæ are whitish or ash-coloured pustules, invading the uvula, fauces, palate, tonsils, inside of the cheeks, gums, tongue, and lips. They for the most part begin at the uvula, sending forth a glutinous mucus, and the pustules covering all or the greatest number of the parts above-mentioned with a thick whitish crust adhering most tenaciously. This crust does not induce an eschar on the parts on which it lies by eating into them, but comes off in whole pieces after the pustules have arrived at maturity. This will often happen in a short time, so that the throat and internal parts of the mouth are frequently observed to be clean which a few years before were wholly covered with white crusts. Neither is this disease confined to the throat and fauces, but is said to affect the œsophagus, stomach, and all parts of the alimentary canal. Aphtha. Of this indeed there is no other proof, than that, after a great difficulty of swallowing, there is sometimes an immense quantity of aphthæ evacuated by stool and vomiting, such as the mouth could not be thought capable of containing.

Causes, &c. The aphthose fever seems to be produced by cold and moisture, as it is found only in the northern countries, and especially in marshy places; and in them the aphthæ often appear without any fever at all.

Prognosis. There is no symptom by which the coming out of aphthæ can be foretold, tho' they are common in many fevers; but they themselves are in general a bad symptom, and always signify a very tedious disorder: the danger denoted by them is in proportion to the difficulty of deglutition; and a diarrhœa accompanying them is likewise bad. This indeed generally carries off old people when they become affected with aphthæ. The dark-coloured aphthæ also are much more dangerous than such as are of a brown or ash colour; but it is a good sign when the appetite returns, and the dark-coloured ones are succeeded by others of a whiter colour. Neither are those which are unaccompanied with fever so dangerous as the other kind.

Cure. As the aphthæ are seldom a primary disease, we must generally endeavour to remove the disorder upon which they depend, after which they will fall off; but in the mean time we are not to neglect applications to the aphthæ themselves, such as detergent and softening gargles made of the decoction of figs, with the addition of honey of roses, a little vinegar, and some tincture of myrrh.

Order IV. HÆMORRHAGIÆ. 234
Hæmorrhagies.

Hæmorrhagiæ, *Vog.* Class II. Ord. I. *Hoffm.* II. 194. *Junck.* 5.
Sanguifluxus, *Sauv.* Class IX. Ord. I. *Sag.* Class V. Order I.

Genus XXXVI. EPISTAXIS. 235
Bleeding at the Nose.

Hæmorrhagia, *Sauv.* gen. 239. *Lin.* 173. *Sag.* gen. 174.
Hæmorrhagia narium, *Hoffm.* II. 196. *Junck.* 6.
Hæmorrhagia plethorica, *Sauv.* sp. 2. *Hoffm.* II. 193.

The other species enumerated by authors are all symptomatic.

Description. The milder species of this hæmorrhagy comes on more frequently in summer than in winter, and for the most part without giving any warning, or being attended with any inconvenience; but the less benign kind is preceded by several remarkable symptoms. These are, congestions of the blood sometimes in one part and sometimes in another, and which are often very troublesome in the sides of the head; there is a redness of the cheeks; an inflation of the face, and of the vessels of the neck and temples; a *tinnitus aurium*; a heavy pain of the eyes, with a prominence

Hæmorrhagiæ

minence, dryneſs, and ſparks; there is a vertiginous affection of the head, with an itching of the noſtrils, and a ſenſe of weight, eſpecially about the root of the noſe. In ſome the ſleep is diſturbed with dreams about blood, fire, &c. Frequently the belly is coſtive, there is a diminution of the quantity of urine, a ſuppreſſion of ſweat, coldneſs of the lower extremities, and tenſion of the hypochondria, eſpecially the right one.

Cauſes, &c. This hæmorrhagy may occur at any time of life; but moſt commonly happens to young perſons, owing to the peculiar ſtate of the ſyſtem at that time. Sometimes, however, it happens after the ακμην and during the ſtate of manhood, at which time it is to be imputed to a plethoric ſtate of the ſyſtem; to a determination of the blood, by habit, to the veſſels of the noſe; or to the particular weakneſs of theſe veſſels.

In all theſe caſes the diſeaſe may be conſidered as an arterial hæmorrhagy, and depending upon an arterial plethora; but it ſometimes occurs in the decline of life, and may then be conſidered as the ſign of a venous plethora in the veſſels of the head. It often happens at any period of life in certain febrile diſeaſes, which are altogether or partly of an inflammatory nature, and which ſhow a particular determination of the blood to the veſſels of the head As by this evacuation, other diſeaſes are often removed, it may on theſe occaſions be deemed truly *critical*. It happens to perſons of every conſtitution and temperament; but moſt frequently to the plethoric and ſanguine, and more commonly to men than women.

Prognoſis. In young people, the bleeding at the noſe may be conſidered as a ſlight diſeaſe, and ſcarce worth notice. But, even in young perſons, when it recurs very frequently and in great quantity, it is alarming; and is to be conſidered as a mark of an arterial plethora, which in the decline of life may give the blood a determination to parts from which the hæmorrhagy would be more dangerous. And this will require more particular attention as the marks of plethora and congeſtion preceding the hæmorrhagy are more conſiderable, and as the flowing of the blood is attended with a more conſiderable degree of febrile diſorder. Theſe conſequences are more eſpecially to be dreaded, when the epiſtaxis happens to perſons after their ακμην, returning frequently and violently. Even in the decline of life, however, it may be conſidered as in itſelf very ſalutary; but at the ſame time it is a mark of a dangerous ſtate of the ſyſtem, i. e. of a ſtrong tendency to a venous plethora in the head, and it has accordingly been often followed by apoplexy, palſy, &c. When it happens in febrile diſeaſes, and is in pretty large quantity, it may be generally conſidered as critical and ſalutary; but it is very apt to be too profuſe, and thus becomes dangerous. It ſometimes occurs during the eruptive fever of ſome exanthemata, and is in ſuch caſes ſometimes ſalutary; but if theſe exanthemata be accompanied with any putrid diſpoſition, this hæmorrhagy, as well as artificial blood-lettings, may have a very bad tendency.

Cure. The treatment in caſes of epiſtaxis may be referred to two heads. 1*ſt*, The treatment during the time of the diſcharge; and, 2*dly*, The treatment after the diſcharge is ſtopt, with the view of preventing the return of it. During the former of theſe periods, it is neceſſary in the firſt place to conſider whether the diſcharge ſhould be left to its natural courſe, or ſtopped by artificial means. In determining this queſtion, regard muſt be paid to the quantity of the diſcharge; the appearance of the blood; the conſtitution with which epiſtaxis occurs; the former habit of the patient; and the conſequences which reſult from the diſcharge. When, from due conſideration of theſe circumſtances, there is reaſon to fear that further evacuation would be attended with bad conſequences, though this diſeaſe has been generally thought very ſlight, it ſhould ſeldom be left to the conduct of nature; and in all caſes it ſhould be moderated by keeping the patient in cool air, by giving cold drink, by keeping the body and head erect, by avoiding any blowing of the noſe, ſpeaking, or other irritation; and if the blood has flowed for ſome time without ſhowing any tendency to ſtop, we are to attempt the ſuppreſſion of the hæmorrhagy, by preſſing the noſtril from which the blood flows, waſhing the face with cold water, or applying this to ſome other parts of the body. Theſe meaſures Dr Cullen judges to be proper even on the firſt attacks, and in young perſons where the diſeaſe is the leaſt hazardous: but they will ſtill be more requiſite if the diſeaſe frequently recurs without any external violence; if the returns happen to perſons diſpoſed to a plethoric habit; and more particularly if the ſigns of plethora appear in the ſymptoms preceding the diſcharge.

Epiſtaxis.

When the bleeding is ſo profuſe that the pulſe becomes weak and the face pale, every means muſt be uſed to put a ſtop to it, and that whether the patient be young or old. Beſides thoſe methods abovementioned, we muſt uſe aſtringents both internal and external; but the latter are the moſt powerful, and the choice of theſe may be left to the ſurgeon. The internal aſtringents are either vegetable or foſſil; but the vegetable aſtringents are ſeldom powerful in the cure of any hæmorrhagies except thoſe of the alimentary canal. The foſſil aſtringents are more active, but differ conſiderably in ſtrength from one another.—The chalybeates appear to have little ſtrength: the preparations of lead are more powerful; but cannot be employed, on account of their pernicious qualities, unleſs in caſes of the utmoſt danger. The *tinctura ſaturnina*, or *antiphthiſica*, is a medicine of very little efficacy, either from the ſmall quantity of lead it contains, or from the particular ſtate in which it is. The ſafeſt and at the ſame time the moſt powerful aſtringent ſeems to be alum

For ſuppreſſing this and other hæmorrhages, many ſuperſtitious remedies and charms have been uſed, and ſaid to have been employed with ſucceſs. This has probably been owing to the miſtake of the by-ſtanders, who have ſuppoſed that the ſpontaneous ceſſation of the hæmorrhagy was owing to their remedy. At the ſame time Dr Cullen is of opinion, that ſuch remedies have ſometimes been uſeful, by impreſſing the mind with horror or dread. Opiates have ſometimes proved ſucceſsful in removing hæmorrhagies; and when the fulneſs and inflammatory diatheſis of the ſyſtem have been previouſly taken off by bleeding, they may, in Dr Cullen's opinion, be uſed with ſafety and advantage. Ligatures have been applied upon the limbs, for retarding the return of the venous blood from

Hemorrhagiæ. from the extremities; but their use seems to be ambiguous. In the case of profuse hemorrhagies, no care is to be taken to prevent the patient from fainting, as this is often the most certain means of stopping them.

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Genus XXXVII. HÆMOPTYSIS. Spitting of Blood.

Hæmoptysis, *Sauv.* gen. 240. *Lin.* 179. *Vog.* 84. *Sag.* gen. 175. *Junck.* 8.
Hæmoptoe, *Boerh.* 1198.
Sanguinis fluxus ex pulmonibus, *Hoffm.* II. 202.

Sp. I. Hæmoptysis from *Plethora.*

Sp. II. Hæmoptysis, from *External Violence.*

Hæmoptysis accidentalis, *Sauv.* sp. 1.
Hæmoptysis habitualis, *Sauv.* sp. 2.
Hæmoptysis traumatica, *Sauv.* sp. 12.

Sp. III. Hæmoptysis with *Pthisis.*

Hæmoptysis phthisica, *Sauv.* sp. 9.
Hæmoptysis ex tuberculo pulmonum, *Sauv.* sp. 10.

Sp. IV. *The Calculous Hæmoptysis.*

Hæmoptysis calculosa, *Sauv.* sp. 14.

Sp. V. *The Vicarious Hæmoptysis.*

Hæmoptysis catamenialis, *Sauv.* sp. 4.
Hæmoptysis periodica, *Sauv.* sp. 5.

Description. This hemorrhagy commonly begins with a sense of weight and anxiety in the chest, some uneasiness in breathing, pain of the breast or other parts of the thorax, and some sense of heat under the sternum; and very often it is preceded by a saltish taste in the mouth. Immediately before the appearance of blood, a degree of irritation is felt at the top of the larynx. The person attempts to relieve this by hawking, which brings up a little florid and somewhat frothy blood. The irritation returns; and in the same manner blood of a similar kind is brought up, with some noise in the wind-pipe, as of air passing through a fluid. Sometimes, however, at the very first, the blood comes up with coughing, or at least somewhat of coughing, and accompanies the hawking above mentioned.

The blood is sometimes at first in very small quantity, and soon disappears; but in other cases, especially when it frequently recurs, it is in greater quantity, and often continues to appear at times for several days together. It is sometimes profuse, but rarely in such quantity as either by its excess or by a sudden suffocation to prove immediately mortal.

It is not always easy to discover whether the blood evacuated by the mouth proceeds from the internal surface of the mouth itself, from the fauces or adjoining cavities of the nose, from the stomach, or from the lungs. It is, however, very necessary to distinguish the different cases; and for this Dr Cullen offers the following considerations.

1. When the blood proceeds from some part of the internal surface of the mouth, it comes out without any hawking or coughing; and generally, upon inspection, the cause is evident.

2. When blood proceeds from the fauces, or adjoining cavities of the nose, it may be brought out by hawking, and sometimes by coughing. In this case there may be a doubt concerning its real source, and the patient may be allowed to please himself with the thoughts that the blood does not come from the lungs. But the physician must remember that the lungs are much more frequently the source of an hemorrhagy than the fauces. The latter seldom happens but to persons who have before been liable to an hemorrhagy from the nose, or to some evident cause of erosion; and in most cases, by looking into the fauces, the distillation of the blood from thence will be perceived.

Hæmoptysis.

3. When blood proceeds from the lungs, the manner in which it is brought up will commonly show from whence it comes; but, independent of that, it may also be known from the causes of hæmoptysis from the lungs, to be afterwards mentioned, having preceded.

4. When vomiting accompanies the throwing out of blood from the mouth, we may generally know the source from whence it proceeds, by considering that blood does not proceed so frequently from the stomach as from the lungs; that blood proceeding from the stomach commonly appears in greater quantity than from the lungs. The pulmonary blood also is usually of a florid colour, and mixed with a little frothy mucus only; but the blood from the stomach is of a darker colour, more grumous, and mixed with the other contents of the stomach. The coughing or vomiting, as the one or the other happens first to arise, may sometimes point out the source of the blood; and this hath also its peculiar antecedent signs and causes.

Causes, &c. An hæmoptysis may be produced at any time of life by external violence; and, in adult persons, while the arterial plethora prevails in the system, *i. e.* from the age of 16 to 35, an hæmoptysis may at any time be produced merely by a plethoric state of the lungs. More frequently, however, it arises from a faulty proportion between the capacity of the lungs and that of the rest of the body. Thus it is often an hereditary disease, which implies a peculiar and faulty conformation.

This disease especially happens to persons who discover the smaller capacity of their lungs by the narrowness of their chest, and by the prominence of their shoulders; which last is a mark of their having been long liable to a difficulty of respiration. In such cases, too, the disease very frequently happens to persons of a sanguine temperament, in whom particularly the arterial plethora prevails. It happens also to persons of a slender delicate make, of which a long neck is a mark; to persons of much sensibility and irritability, and therefore of quick parts; to persons who have formerly been liable to hemorrhagies from the nose; to those who have suffered a suppression of any usual hemorrhagy, the most frequent instance of which is in females, who have suffered a suppression of their menstrual flux; and, lastly, to persons who have suffered the amputation of any considerable limb.

All this constitutes the predisponent cause of hæmoptysis; and the disease may happen merely from the predisponent cause arising to a considerable height. But in those who are already predisposed, it is often brought on by the concurrence of various occasional and

Hemorrhagiæ. and exciting causes. One of these, and perhaps a frequent one, is external heat; which, even when in no great degree, brings on the disease in spring, and the beginning of summer, while the heat rarifies the blood more than it relaxes the solids, which had before been contracted by the cold of winter. Another exciting cause is a sudden diminution of the weight of the atmosphere, especially when concurring with any effort in bodily exercise. The effort too, alone, may often be the exciting cause in those who are already predisposed; and more particularly any violent exercise of respiration. In the predisposed, also, the disease may be occasioned by any degree of external violence.

Prognosis. Hæmoptysis may sometimes be no more dangerous than a hemorrhagy from the nose; as when it happens to females, in consequence of a suppression of their menses; when, without any marks of predisposition, it arises from external violence; or, from whatever cause arising, when it leaves no cough, dyspnœa, or other affection of the lungs, behind it. But, even in these cases, a danger may arise from too large a wound being made in the vessels of the lungs, from any quantity of red blood being left to stagnate in the cavity of the bronchiæ, and particularly from any determination of the blood being made into the vessels of the lungs, which by renewing the hemorrhagy may have these consequences.

Cure. In the treatment of this disease, with a view of stopping the discharge, it is first necessary to have recourse to those measures which tend to diminish the impetus by which the blood is expelled. This is to be effected by a removal of plethora when it exists; by diminishing the general impetus of circulation; by diminishing local increased action when it takes place in the vessels of the lungs; and by producing a determination of blood to other parts of the system remote from the lungs. But besides practices diminishing impetus, it is often also necessary to employ such as augment the resistance to the passage of blood through the ruptured vessels of the lungs. With these views a variety of practices may be employed, particularly blood-letting, refrigerants, sedatives, astringents, and the like.

On this subject Dr Cullen differs from those who prescribe chalybeates and the Peruvian bark in the cure of hæmoptysis. Both of these, he observes, contribute to increase the phlogistic diathesis then prevailing in the system, and the hæmoptysis from predispotion is always accompanied with such a diathesis. Instead of these, therefore, he recommends blood-letting in greater or smaller quantity, and more or less frequently repeated as the symptoms shall direct. At the same time cooling purgatives are to be employed, and every part of the antiphlogistic regimen is to be strictly enjoined. In the London Medical Observations, the use of nitre is greatly recommended by Dr Dickson, to whom its efficacy was made known by Dr Letherland, physician to St Thomas's hospital. The most commodious method of exhibiting it he found was in an electuary. Four ounces of conserve of roses were made into an electuary with half an ounce of nitre; of which the bulk of a large nutmeg was directed to be given, four, six, or eight times a day, according to the urgency of the case. The good effects of this, he tells us, have often astonished him; and when given early in the disease, he says he can depend as much upon it for the cure of an hæmoptysis, as on the bark for the cure of an intermittent. He agrees with Dr Cullen, however, that in those cases where there is any hardness in the pulse, and which almost always happens, there is a necessity for venesection. A cool regimen, and quiet of body and mind, are certainly useful; but Dr Cullen observes, that some kinds of gestation, such as sailing, and travelling in an easy carriage on smooth roads, have often proved a remedy. When the cough is very troublesome, it is absolutely necessary to exhibit frequently a small dose of an opiate. Dr Dickson also informs us, that the nitre joined with spermaceti, or *pulv. e tragacanth. comp.* has produced equally good effects with the electuary above mentioned; in the composition of which he at first considered the conserve only as a vehicle for the nitre, though he means not to insinuate that the former is totally destitute of efficacy.

Hæmoptysis.

When this hemorrhagy has resisted other modes of cure, and there is reason to apprehend, even from the mere quantity of blood evacuated, that the patient may sink under the discharge, blisters, particularly when applied to the breast, are often had recourse to with great advantage; and the vitriolic acid, properly diluted, both as an astringent and refrigerant, is often employed with very good effects.

PHTHISIS.
Pulmonary Consumption. 237

Phthisis, *Sauv.* gen. 276. *Lin.* 208. *Vog.* 319. *Sag.* 101. *Junck.* 33.
Phthisis pulmonis, *Boerh.* 1196.
Affectio phthisica, sive tabes pulmonalis, *Hoffm.* II. 284.

Sp. I. The *Incipient Phthisis*, without expectoration of *Pus*. 238

Phthisis incipiens, *Morton.* Physiolog. L. II. cap. 3.
Phthisis sicca, *Sauv.* sp. 1.

Sp. II. The *Confirmed Phthisis*, with an expectoration of *Pus*. 239

Phthisis confirmata *auctorum.*
Phthisis humida, *Sauv.* sp. 2.

Sometimes, notwithstanding all the care we can take, the hæmoptysis will degenerate into a phthisis pulmonalis, or consumption of the lungs; and sometimes an hæmoptysis will be the consequence of this dangerous disorder. It has been indeed supposed, that an ulceration of the lungs or phthisis was the natural and almost necessary consequence of an hæmoptysis: but, according to Dr Cullen, this is in general a mistake; for there are many instances of an hæmoptysis from external violence without being followed by any ulceration. The same thing has often been observed where the hæmoptysis arose from an internal cause; and this not only in young persons, when the disease returned for several times, but when it has often recurred during the course of a long life; and it may easily be conceived, that a rupture of the vessels of the lungs, as well as of the vessels of the nose, may be sometimes healed. The causes of phthisis, therefore, Dr Cullen reduces to five heads. 1. An hæmoptysis. 2. A suppuration of the lungs in consequence of a pneu-

Hæmorrhagiæ pneumonia. 3. A catarrh. 4. An asthma; and, 5. Tubercles.

1. When a phthisis arises from an hæmoptysis, it is probable that it is occasioned by particular circumstances; and what these circumstances are, may not always be easily known. It is possible, that merely the degree of rupture, or frequently repeated rupture, preventing the wound from healing, may occasion an ulcer; or it is possible, that red blood effused, and not brought up entirely by coughing, may, by stagnating in the bronchiæ, become acrid, and erode the parts. But these hypotheses are not supported by any certain evidence; and from many observations we are led to think, that several other circumstances must concur in producing the disease from hæmoptysis.

2. The second cause of an ulceration of the lungs mentioned above is a suppuration formed in consequence of pneumonia. When a pneumonia, with symptoms neither very violent nor very slight, has continued for many days, it is to be feared it will end in a suppuration: but this is not to be determined by the number of days; for, not only after the fourth, but even after the tenth day, there have been examples of a pneumonia ending by a resolution; and if the disease has suffered some intermission, and again recurred, there may be instances of a resolution happening at a much later period from the beginning of the disease than that just now mentioned. But, if a moderate disease, in spite of proper remedies employed, be protracted to the 14th day without any considerable remission, a suppuration is pretty certainly to be expected; and it will be more certain still, if no signs of resolution have appeared, or if an expectoration which had appeared shall have again ceased, and the difficulty of breathing has continued or increased, while the other symptoms have been rather abated.

That in a pneumonia, the effusion is made which may lay the foundation of a suppuration, may be concluded from the difficulty of breathing becoming greater when the patient is in a horizontal posture, or when the patient can lie more easily on the affected side. That, in such cases, a suppuration is actually begun, may be inferred from the patient's being frequently affected with slight cold shiverings, and with a sense of cold felt sometimes in one sometimes in another part of the body. We form the same conclusion also from the state of the pulse, which is commonly less frequent and softer, but sometimes quicker than before. That a suppuration is already formed, may be inferred from there being a considerable remission of the pain which had before subsisted; while with this the cough and especially the dyspnœa continue, and are rather increased. At the same time the frequency of the pulse is rather increased, the feverish state suffers considerable exacerbations every evening, and by degrees a hectic fever in all its circumstances comes to be formed.

In this state of symptoms, we conclude very confidently, that an abscess, or, as it is called, a *vomica*, is formed in some part of the pleura, and most frequently in that portion of it investing the lungs. Here purulent matter frequently remains for some time, as if enclosed in a cyst; but commonly not long before it comes to be either absorbed and transferred to some other part of the body, or breaks through into the cavity of the lungs, or into that of the thorax. In the latter case it produces the disease called *empyema*; but it is when the matter is poured into the cavity of the bronchiæ that it properly constitutes the phthisis pulmonalis. In the case of empyema, the chief circumstances of a phthisis are indeed also present: but we shall here consider only that case in which the abscess of the lungs gives occasion to a purulent expectoration.

Phthisis.

An abscess of the lungs, in consequence of pneumonia, is not always followed by a phthisis: for sometimes a hectic fever is not formed; the matter poured into the bronchiæ is a proper and benign pus, which frequently is coughed up very readily, and spit out; and though this purulent expectoration should continue for some time, if it be without hectic fever, the ulcer soon heals, and every morbid symptom disappears. This has so frequently happened, that we may conclude, that neither the access of the air, nor the constant motion of the lungs, will prevent an ulcer of these parts from healing if the matter of it be well-conditioned. An abscess of the lungs, therefore, does not necessarily produce the phthisis pulmonalis; and if it be followed by such a disease, it must be in consequence of particular circumstances which corrupt the purulent matter produced, render it unsuitable to the healing of the ulcer, and at the same time make it afford an acrimony, which, absorbed, produces a hectic fever and its consequences.

The corruption of the matter of such abscesses may be owing to several causes; as, 1. That the matter effused during the inflammation had not been a pure serum fit to be converted into a laudable pus, but had been joined with other matters which prevented that, and gave a considerable acrimony to the whole. Or, 2. That the matter effused and converted into pus, merely by long stagnation in a vomica, or by its connection with an empyema, had been so corrupted as to become unfit for the purpose of pus in the healing of the ulcer. These seem to be possible causes of the corruption of matter in abscesses, so as to make it the occasion of a phthisis in persons otherwise sound; but it is probable that a pneumonic abscess especially produces phthisis when it happens to persons previously disposed to that disease, and therefore only as concurring with some other causes of it

3. The third cause supposed to produce a phthisis is a catarrh; which, in many cases, seems in length of time to have the expectoration of mucus proper to it gradually changed to an expectoration of pus; and at the same time, by the addition of a hectic fever, the disease, which was at first a pure catarrh, is changed into a phthisis. But this supposition is, in the opinion at least of some physicians, liable to several difficulties. The catarrh is properly an affection of the mucous glands of the trachea and bronchiæ analogous to the coryza and less violent kinds of cynanche tonsillaris, which very seldom end in suppuration. And although a catarrh should be disposed to do so, the ulcer produced might readily heal up, as it does in the case of a cynanche tonsillaris; and therefore should not produce a phthisis.

Further, the catarrh, as purely the effect of cold, is generally a mild disease as well as of short duration; and, according to Dr Cullen, there are at most but very few of the numerous cases of it, which can be said

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to have ended in a phthisis. In all these cases in which this seems to have happened, he thinks it probable that the persons affected were peculiarly predisposed to phthisis; and the beginning of phthisis so often resembles a catarrh, that it may have been mistaken for such a disease. It often happens also, to increase the fallacy, that the application of cold, which is the most frequent cause of catarrh, is also frequently the exciting cause of the cough, which proves to be the beginning of a phthisis.

Many physicians have supposed that an acrimony of the fluids eroding some of the vessels of the lungs is a frequent cause of ulceration and phthisis; but this appears to Dr Cullen to be a mere supposition. He acknowledges, that in many cases an acrimony subsisting in some part of the fluids is the cause of the disease; but observes that it is at the same time probable, that this acrimony operates by producing tubercles, rather than by any direct erosion.

But notwithstanding these objections, experience affords numerous examples of cases in which a disease long subsisting under the form of catarrh has at last degenerated into phthisis, and proved fatal from supervening hectic fever. It must, however, at the same time be allowed, that catarrh, degenerating into a chronic state after subsisting for many years, has of itself often proved fatal without inducing phthisis.

4. If phthisis does not frequently follow catarrh, it is still more rarely a consequence of asthma. Innumerable examples are unquestionably afforded of that disease subsisting for many years without any symptom whatever of phthisis as a consequence of it. But at the same time, there are unquestionable examples of phthisis deriving its origin from asthma; which, however, probably happens only in cases where a peculiar state of the lungs at the same time takes place: But without the concurrence of asthma, this state would not of itself have been sufficient for inducing the affection.

5. Of all the causes formerly mentioned, phthisis most frequently arises from tubercles. Dr Simmons informs us, that he has had opportunities of inspecting the bodies of many people who died in this way, and never found them totally absent. He has likewise seen them in subjects of different ages, who had been troubled with no symptoms of an affection of the breast during their lifetime. In these, however, they were small, and few in number. This proves that they may exist without inconvenience till they begin to disturb the functions of the lungs by their size and number; or till some degree of inflammation be excited, either by accidental causes, or by certain changes that take place within their substance; for as yet we know but little of their true nature. These little tumors vary in their consistence; in some they are composed of a pulpy substance, and in others approach more to the nature of scirrhous. They are most commonly formed in consequence of a certain constitutional predisposition; but whatever is capable of occasioning a morbid irritability of the lungs seems also to be capable of generating them. Thus the spasmodic asthma frequently ends in tubercles and consumption; and it is not unusual for millers, stone-cutters, and others, to die consumptive, from their being so constantly exposed to dust, which in these cases probably acts by producing similar concretions: and Dr Kirkland observes, that scythe-grinders are subject to a disease of the lungs, from particles of sand mixing with iron-dust, which among themselves they call the *grinders rot*. Tubercles, however, in by much the greater number of instances, have their source from a scrophulous disposition; and some eminent physicians have supposed that the generality of pulmonary consumptions are of this kind. This notion, however, they have perhaps carried too far: they have probably been misled by these tuberculous concretions which, without good reason, have been supposed to be diseased glands, and of course analogous to the glandular affections we meet with in the scrophula. Tubercles may likewise sometimes be owing to the sudden repulsion of cutaneous eruptions, or of the matter of exanthemata, &c. or to other causes.

Phthisis.

The persons who are most liable to consumption are those of a fair complexion, fine and soft skin, florid cheeks, and a slender make; with high cheek-bones, hollow temples, long neck, shoulders standing out like wings, narrow chest, and a remarkable prominence of the processes of the os sacrum. To these marks we may add, that of *found teeth*, which, as the disease advances, usually become of a milky white colour, and more or less transparent. Of those who are carried off by this disease, Dr Simmons asserts, the greater number will be found never to have had a carious tooth. This circumstance, however, does not seem to us to hold so generally as Dr Simmons is disposed to imagine: and instances not unfrequently occur of patients dying of phthisis, although they have had many teeth subjected to caries; and some of these beginning even at an early period of life.

Persons of the above description often remain for a long time without feeling any other inconvenience than some oppression at the breast in moist weather, or in hot apartments. Their breathing is easily hurried, sometimes by the slightest motion; and they become languid, paler, and thinner. All this time, however, they feel no heat or painful sensation in the breast. As the evil increases, the patient begins to be attacked with a slight, frequent, and dry cough, which is most troublesome in the night-time. But this, by proper care, is often relieved; and the patient remains in this state for a considerable time, and even for many years, if he be sensible of his danger, and careful to guard against it by a suitable manner of living. More commonly, however, we find the cough increasing, and sometimes accompanied with more or less catarrh. This is usually ascribed to cold; and but too generally neglected, till the disease become alarming by its obstinacy and its affects. This may be considered as the *beginning*, or first period, of the disease. During this stage, the cough is sometimes dry from the first; and sometimes, when it begins in the form of a catarrh, is attended with more or less expectoration of mucus.

When the cough begins in the form of a catarrh, and appears to be occasioned by an increased secretion of a thin saltish mucus irritating the membrane of the trachea, all judicious practitioners agree in recommending an attention to regimen, the free use of diluting liquors, bland emulsions, small doses of nitre, the taking away a few ounces of blood if there be much in-

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inflammation, the inhaling the fteams of warm water by means of the machine contrived for that purpofe, and the occafional ufe of fuch a dofe of elixir paregoricum as will be fufficient to allay the irritation of the bronchiæ, and to promote a gentle moifture on the fkin. Thefe methods will generally be found to be efficacious, efpecially if the patient's chamber be of a moderate temperature, and he carefully avoid expofure to a cold, damp, or raw air, till the complaint be removed. In cafes in which the cough has been obftinate, and the inflammatory fymptoms confiderable, Dr Simmons has often experienced the great advantages of the warm bath, the heat of which did not exceed 92°. When this is had recourfe to, the patient fhould remain in it only a very few minutes, and go foon afterwards to bed; but not with a view to force a fweat by an increafed weight of bed-clothes, as is too often injudicioufly practifed.

Patients of a confumptive habit, who have had an attack of this kind at the beginning of winter, are particularly liable to a return of the complaint during the continuance of the cold feafon, on the flighteft occafion and with greater violence. A relapfe is therefore to be carefully guarded againft; and nothing will be found to do this more effectually than the ufe of focks and a flannel under-waiftcoat. The ufe of flannel has been condemned by feveral medical writers as increafing the infenfible perfpiration; but in the prefent cafe, to fay nothing of fome others in which it may be ufeful, it will in general be found to have the beft effects. It will prevent a too great determination to the lungs, and fhould not be left off till the approach of fummer. In fome few inftances in which flannel was found to have a difagreeable effect, a piece of dimity, worn over the breaft next the fkin, prevented the return of colds and coughs in perfons of a delicate habit, who had before been liable to them on the flighteft occafions. Shirts made of cotton cloth are much more effectual than linen in preferving an equable temperature of the furface, and guarding againft the action of external cold; while at the fame time they are much more pleafant to moft people than even the fineft flannel. In thefe cafes, circumftances that are feemingly of the moft trifling nature become of importance.

Sometimes the cough is occafioned by an immediate inflammation of fome part of the lungs, from fome of the ufual caufes of inflammation; and when this happens, no time is to be loft in removing it. To do this will perhaps require more than one bleeding, together with a ftrict attention to a cooling plan of diet, diluting drinks, the inhalation of warm fteams, and if convenient the ufe of the warm bath; but above all, the fpeedy application of a large blifter as near as may be to the fuppofed feat of the inflammation. The cough, in this cafe, will often remain after the original complaint is abated. A prudent ufe of opiates at bed-time, either by themfelves or combined with gummy and mucilaginous medicines, will then generally be ufeful as a fedative and antifpafmodic.

In this, as well as in the catarrhal cough juft now mentioned, many practitioners are too eager to adminifter the Peruvian bark, with the view, as they term it, of *bracing up* the patient: but this never fails to increafe the cough, and of courfe to do great and very often irreparable mifchief.

Phthifis.

And here it will not be foreign to our fubject to obferve, that a fymptomatic cough, which has its rife not from catarrh, or from an immediate inflammation of the lungs, but from their fympathy with the ftomach, has fometimes laid the foundation of phthifis, from its having been miftaken, and of courfe improperly treated. It feems to be owing to a redundancy or vitiated ftate of the bile, or to fome affection of the ftomach, which it is perhaps not eafy to define. It is fometimes a concomitant of other bilious fymptoms; and when this happens to be the cafe, it cannot eafily be miftaken; but we fometimes find it occurring fingly, and in general attacking perfons of a fedentary life. Dr Stoll of Vienna, who has noticed this cough, has very properly given it the name of *tuffis ftomachica*. This complaint is fo far from being relieved by bleeding, that it conftantly grows worfe after it, efpecially if the evacuation be in any confiderable quantity. The oily remedies feldom fail to exafperate this cough, which at firft is dry, frequent, and often extremely violent, but which feldom fails to give way to one or two gentle pukes, and the occafional ufe of mild cathartics. The cough, as in other cafes, often continues from habit after the caufe that gave rife to it has been removed, and may then be checked by opiates.

When the difeafe has been neglected, or our attempts to remove it in the beginning have failed, both of which circumftances but too frequently happen, the patient begins to complain of a forenefs, and of flight lancinating pains fhooting through the breaft, fometimes in the direction of the mediaftinum, and fometimes confined chiefly to one fide. The forenefs is pretty conftant, and much increafed by the cough. The pain in the fide often prevents the patient from lying on the fide affected; and this inability of lying, except on one fide, frequently occurs even when no fuch pain is felt. In this ftage of the difeafe, flufhing heats are felt in the palms of the hands and foles of the feet: the breathing is fhort and laborious; and it is not long before the patient begins to expectorate a thin and frothy phlegm, at firft in fmall quantities, coughed up with difficulty, and fome pain of the breaft, and now and then ftreaked with blood: this may be confidered as the *inflammatory period* of the difeafe, to which fucceeds the *fuppurative ftage*. In the latter, the expectoration becomes more copious and purulent, the breath proportionably offenfive, and the exacerbations of the hectic fever more confiderable: an increafed quicknefs of the pulfe comes on about the middle of the day; but the moft confiderable paroxyfm of the fever is at night, and at firft continues till towards morning, commonly till three or four o'clock, when it terminates in a fweat, which ufually begins upon the breaft. As the difeafe advances, thefe fweats become more profufe, and fometimes come on almoft as foon as the pulfe begins to quicken, but without affording any relief to the patient. During the exacerbations, we obferve a circumfcribed rednefs of the cheeks, while the reft of the face is pale, and appears as if it were not clean wafhed. The coftivenefs that commonly accompanies the beginning of the difeafe is ufually fucceeded by a diarrhœa; the fpitting leffens,

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and all the purulent matter ſeems to be carried downwards. The waſting of the fat and the loſs of nouriſhment occaſion the nails to curve inwards, the hair to fall off, and the eyes to ſink in their ſockets. In the mean time, the legs commonly ſwell; till at length death cloſes a ſcene which is melancholy to all but the patient himſelf, who in general continues ſenſible to the laſt moment, and even then indulges a vain hope of prolonging a miſerable exiſtence. In ſome caſes, and that not unfrequently, a delirium comes on towards the cloſe of the diſeaſe.

The hectic fever that attends this and ſome other chronic diſeaſes, is evidently the effect of acrimony, and moſt commonly of pus abſorbed and carried into the circulation. The nature of this acrimony, and the different irritability of different patients, are probably the ſources of the variety we obſerve in fevers of this denomination; a variety which is doubtleſs much greater than we are aware of. Thus we find that the matter of the ſmall-pox excites a fever of this kind; but this *ſecondary fever*, as it is called, differs from the hectic attendant on conſumptions; nor does the latter correſpond with that which ſometimes accompanies the ſuppuration of a cancerous ulcer. In the pulmonary conſumption, or at leaſt in the third ſtage of it, the fever induced often appears to be of the putrid kind, and has been denominated *febris hectica putrida* by the judicious Morton, who conſiders it as being combined with a peripneumonic or inflammatory fever, which recurs as often as freſh tubercles begin to inflame. For although we have named one period of the diſeaſe the *inflammatory*, and another the *ſuppurative period*, yet we are not to ſuppoſe that the latter is exempt from inflammation. While matter is poured into the bronchiæ, or abſorbed and carried into the ſyſtem from one part of the lungs, other parts are in a crude ſtate of inflammation, or advancing towards ſuppuration; ſo that, on examining the lungs of perſons who die conſumptive, we find ſome tubercles that are ſmall and juſt formed, ſome that are large and full of matter, and others that are in a ſtate of ulceration. This eaſily accounts for the occaſional combination of inflammatory ſymptoms with thoſe of the putrid hectic. When the matter abſorbed is a laudable pus, as in the caſe of a pſoas abſceſs, we find the form of the hectic fever differing from either of thoſe we have mentioned.

Cure. In theſe different periods of the diſeaſe, the curative indications are ſufficiently obvious. To prevent the formation of freſh tubercles; to obviate the inflammation of thoſe already formed; to promote their reſolution; to allay morbid irritability, the cough, and other troubleſome ſymptoms; and, above all, to check the tendency to the hectic ſtate, are the views that every rational phyſician propoſes to himſelf in the treatment of the genuine conſumption. We know of no medicines that can exert their ſpecific effects upon the lungs by diſſolving tuberculous concretions; nor is it probable, from what we know of the animal œconomy, that any ſuch will ever be diſcovered. Yet medicines that operate in a general manner upon the ſyſtem, may, by promoting abſorption, and diminiſhing the determination to the lungs, tend to diſperſe tubercles, or to prevent their formation. There are not wanting inſtances of wonderful recoveries in caſes where the evil was ſuppoſed to be beyond the power of phyſic; and in ſome, where nature was left to herſelf; ſo that a phyſician who has obſerved the various and powerful reſources nature has within herſelf, will be very cautious how he aſſerts that a diſeaſe is incurable.

Phthiſis.

The moſt formidable effects of ulcerated lungs are the abſorption and conſequent hectie. It ſeems evident, that, in many caſes, death is brought on by this, rather than by the lungs themſelves being rendered unfit for the purpoſes of reſpiration. So that if we can obviate the effects of the abſorption, diminiſh the preternatural determination to the lungs, and fulfil the other general indications juſt now mentioned, we may very often enable nature to recover herſelf. It may be alleged indeed, that the phyſician's art has hitherto proved very unſucceſsful in theſe caſes; but may not this be owing to the remedies that are employed being very often ſuch as are inimical to the cure?

The Peruvian bark is, perhaps, the moſt commonly employed of any, and often confided in as an ultimate reſource in theſe caſes. But beſides this, the elixir of vitriol, the balſams, and frequent bleedings, have each had their partizans. The uſe of bliſters and iſſues, opiates, a milk and vegetable diet, exerciſe, and change of air, are pretty generally recommended by all. Concerning the bark, Default long ago obſerved, that it had been productive of great miſchief in conſumptive caſes; and Dr Fothergill, in a paper lately publiſhed by him on this ſubject, very judiciouſly remarks, that the bark is ſo far from curing the hectic fever ariſing from diſtempered lungs, that, according to the beſt of his obſervations, it not only takes up that time which might probably have been better employed in the uſe of other medicines, but for the moſt part aggravates the diſeaſe beyond remedy. Indeed it has been the opinion of ſeveral attentive obſervers, that, whenever pus or any kind of matter excites an hectic fever, by being abſorbed and carried into the circulation, the Peruvian bark will never fail to exaſperate the complaint, eſpecially if it be accompanied with any degree of inflammatory diatheſis, unleſs the matter has a free outlet from the ſyſtem; as in the caſe of abſceſſes, for inſtance, in which we often find the bark productive of excellent effects. It is likewiſe well known to be uſed as a tonic, to obviate the effects of fluor albus, or any other immoderate evacuation in delicate perſons, which, by enfeebling the ſyſtem, very often lays the foundation of phthiſis: but the moment we have reaſon to ſuſpect that the lungs are ulcerated, eſpecially if this ulceration be attended with an inflammatory diſpoſition; or if the ſeparation of vitiated pus be the conſequence of a peculiar increaſed morbid action of the veſſels at the part, it ought to be laid aſide; and in the genuine tuberculous conſumption, perhaps it is at all times inadmiſſible.

Dr Fothergill, however, obſerves, that there are two cauſes of conſumptions, which often produce ſymptoms ſo ſimilar to thoſe of the genuine phthiſis, as ſometimes to have led him to make uſe of the bark in apparent tendencies to a genuine pulmonary conſumption with advantage.

One of theſe cauſes is, the ſuckling of children longer than is conſiſtent with the mother's ability.

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This cafe frequently occurs among the middling and lower claffes of females of conftitutions naturally delicate and tender. In fuch a ftate of weaknefs, fome flight cold brings on a cough, which increafes gradually, till at length it produces the true pulmonary confumption. Here the bark given early, in moderate dofes, and merely as a tonic remedy, is often of excellent ufe.

Another caufe is, any weakening difcharge, either from abfceffes, the greater operations of furgery, a copious and conftant *fluor albus*, or fimilar enfeebling evacuations. That the bark is, for the moft part, of ufe in thefe cafes, when the lungs are not inflamed, is indubitable; and if they be fo affected, but not beyond a certain degree, it is alfo efficacious in preventing the progrefs of the confumption.

In phthifical complaints fucceeding fuch fituations, a prudent trial of the bark feems neceffary. Small dofes of the decoction, either alone, or joined with the faline mixture or fuch other additions as the phyfician thinks proper, may be given. But if the breath becomes more tight and oppreffed, the cough dry, the pulfe more quick and hard, and efpecially if flight tranfitory pains or ftitches about the thorax are more frequently complained of, a perfeverance in the ufe of the bark will increafe the difeafe. If fuch alfo fhould be the appearances in the progrefs of the difeafe, or, from whatever caufe, if the bark be accompanied with fuch effects, the ufe of it ought to be with-held.

If, on the other hand, no pain, tightnefs, or oppreffion, is perceived, and there appears a manifeft abatement of the fymptoms, it will be advifable to proceed. The adminiftration of this medicine, however, requires a judicious obferver; and it ought neither to be given in the early inflammatory ftage of this difeafe, nor be continued in any fubfequent period, if it produce the effects above-mentioned.

By its tonic virtues it will often enable nature to conquer many difficulties. In confirmation of this remark, Dr Fothergill farther obferves, that he has feen it of ufe in promoting expectoration, when this became deficient from want of ftrength towards the end of peripneumonic fevers; but that it ftops this difcharge, changes flight wandering pains into fuch as are fixed, and increafes them with all their confequences, in a variety of cafes.

The elixir of vitriol, or the pure vitriolic acid properly diluted, though in many inftances a highly ufeful remedy, is often exhibited in confumptive cafes with no lefs impropriety than the bark. This medicine, from its aftringency, is obvioufly improper in the inflammatory ftate of the difeafe. But in the latter ftage, when a general tendency to putrefaction takes place, it is ferviceable in refifting the effect; it reftrains the colliquative fweats; and if the lungs be not injured paft reparation, it is allowed to be a very ufeful auxiliary.

Various are the opinions concerning the efficacy of Briftol-water in this difeafe. The experienced author laft mentioned informs us, that he has feen many perfons recover from pulmonary difeafes after drinking thefe waters, whofe cure feemed to be doubtful from any other procefs; and he thinks this circumftance, added to the general reputation of Briftol-waters in phthifical cafes, affords fufficient inducement to recommend the trial of them in the early ftages of fuch complaints. It is, however, before the approach of a confirmed phthifis that patients ought to repair to Briftol; otherwife a journey thither will not only be without benefit, but may even prove detrimental.

Phthifis

Some have imagined, that the journey, a better air, change of fituation and of objects, have contributed to the patient's recovery; and thefe may doubtlefs be of advantage. It feems, however, that the water drank frefh at the pump, actually contains principles conducive to the recovery of patients affected with phthifical complaints. It feems to poffefs a flight calcareous ftypticity, and perhaps the air it contains may alfo have an antifeptic quality. On the whole, it appears to be an efficacious medicine, and is often found of remarkable benefit to confumptive patients.

Change of air, particularly from good to bad, is of great confequence in all chronic difeafes of the lungs. In confumptive cafes, the air of all large cities is found to be particularly injurious.

A fea-voyage has been much recommended in the cure of this difeafe. The benefit of exercife has alfo been ftrongly urged by many writers; but, however falutary when properly ufed, it certainly ought to be regulated with difcretion. Dr Dickfon declares himfelf of opinion, that riding on horfeback in confumptive cafes is moft commonly hurtful, without fuch regulations as in general have been little regarded. For inftance, he has known a perfon who, by a ride of an hour or two in the morning, was very much recruited, and who, at another time, in the afternoon and evening, without undergoing more bodily motion, has returned faint and languid, and apparently worfe. This obfervation on the fame perfon has been fo frequently made, as to point out clearly the times when this exercife fhall not do hurt in confumptive cafes. In this difeafe, the pulfe, however calm in the morning, becomes more frequent in the afternoon and night, attended with heat and other feverifh fymptoms. Exercife therefore, at this time, can only add to the mifchief of the fever. For this reafon he prudently recommends to all hectic perfons, efpecially thofe who fhall travel to diftant places on account of a better air, or the benefit expected from any particular water, that their travelling fhould be flow, confined to a very few hours, and only in the morning.

Exercife on horfe-back feems to be chiefly beneficial in thofe cafes where confumption is a fecondary difeafe. For example, in the nervous atrophy; in the hypochondriacal confumption; or when it is the effect of long-continued intermittents, or of congeftions in any of the abdominal vifcera; or, in a word, whenever the confumption is not attended with an inflamed or ulcerated ftate of the lungs; long journeys on horfeback will be beneficial. Such a practife may likewife be highly ufeful in obviating an attack of phthifis, or in carrying off a dry hufky cough in a perfon of a confumptive habit, when there is reafon to fuppofe that no tubercles are as yet formed. On the other hand, in the confirmed phthifis, when the lungs are inflamed or ulcerated, much or violent exercife will be improper; and there have been inftances where the death of the patient was evidently accelerated by

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it. The exercife therefore fhould be gentle, proportioned to the ftrength of the patient, and employed only in the morning. In fine weather, an eafy open carriage is perhaps the moft eligible, not only on account of its being open to the air, but becaufe it affords that kind of agitation which is moft wanted in thefe cafes. For if we confider the different modes of exercife, we fhall find that walking, though the beft exercife in health, as it employs the moft mufcles, is the worft for the fickly, who fhould have the benefit of exercife without fatigue. Riding on horfeback agitates the vifcera more than walking, and is therefore preferable to it in many chronic difeafes; but when a preternatural determination to the lungs has taken place, it will be liable to increafe the evil, and may likewife be hurtful by the fatigue that attends it. For thefe reafons it will be prudent to begin with a carriage; and if the patient gain ftrength, and the difeafe abates, recourfe may afterwards be had to horfe-exercife.

The gentle motion of a coach has been often found of great utility in pulmonary complaints. Its efficacy feems to depend chiefly on its increafing the determination to the furface of the body. The naufea which this motion excites in fome perfons is an effect of this increafed determination. It has therefore been found beneficial in hæmoptyfis; and Dr Simmons mentions the cafe of a lady, who, after trying various remedies to no purpofe, was cured of this complaint by travelling feveral hundred miles through different parts of England in her own coach. At firft, whenever fhe tarried three or four days in any place, the diforder began to return again; but at length by perfevering in her journeys, it gradually went off. Default, who practifed at Bourdeaux about 40 years ago, tells us, he fent feveral confumptive patients to Bareges, and with good fuccefs; but that in thefe cafes his reliance was not fo much upon the Bareges waters, as upon the motion of the carriage and the change of air in a journey of more than 100 leagues.

It is now pretty generally acknowledged, that the good effects of fea-voyages in confumptive cafes depend more upon the conftant and uniform motion of the fhip, than upon any particular impregnation of the fea-air; although this from its coolnefs and purity may likewife be of great ufe, efpecially in the hot months, when fea-voyages are generally undertaken by confumptive patients. The ancients were no ftrangers to this remedy; and amongft the Romans it was no unufual thing for confumptive perfons to fail to Egypt. Pliny obferves, that this was done not for the fake of the climate, but merely on account of the length of the voyage.

Many of our Englifh phyficians have recommended a voyage to Lifbon in thefe cafes. When this is done, the proper feafon of the year fhould be carefully attended to. Dr Simmons knew a gentleman who went thither with fymptoms of incipient phthifis, and who experienced fome relief during the courfe of the voyage; but happening to arrive at Lifbon at the beginning of the rainy feafon, the difeafe was foon greatly increafed, and terminated fatally.

Another fpecies of motion has of late been extolled as highly ufeful in confumptive cafes. Dr James Carmichael Smyth of London, has lately publifhed an account of the effects of fwinging, employed as a remedy in the pulmonary confumption and hectic fever. In this treatife Dr Smyth contends, that fea-air, in place of being of advantage, is conftantly prejudicial to hectic and confumptive patients, and even to thofe who have a tendency to fuch complaints. He thinks, therefore, that the benefit derived from fea-voyages muft certainly be referred to fome other caufe. In ftating his fentiments on this fubject, he attempts to eftablifh a diftinction between exercife and motion. By exercife, he underftands mufcular action, or the exertion of the loco-motive powers of the body either alone or combined. This he reprefents as increafing the force and frequency of the heart's contraction, the velocity and momentum of the blood, the quicknefs of breathing, the heat, the irritability, and the tranfpiration of the whole body. By motion, in contradiftiction to exercife, he means fuch motion as is not neceffarily accompanied with any agitation or fucceffion of the body, and which is totally independent of any mufcular exertion. The effects of this, both on the heart, the lungs, and indeed on the fyftem in general, he confiders as of the fedative kind; thus it fufpends the action of coughing, and leffens the frequency of the pulfe. He is, therefore, led to refer the good effects of fea-voyages entirely to this caufe. And on thefe grounds he was led to conclude, that the motion given by fwinging might be of equal if not greater fervice. This conclufion, we are told, in the treatife above alluded to, experience in many cafes has fully confirmed. And he recommends it as a mode of cure which may be employed with advantage in every ftage of phthifis. While, however, the reafoning of Dr Smyth on this fubject feems to be liable to many objections, we are forry to add, that his obfervations in practice have by no means been confirmed by thofe of others, who have had recourfe to this mode of cure.

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The beft adapted diet in confumptive cafes is milk, particularly that of affes. It may however be remarked, that there are conftitutions in which this falutary nutriment feems to difagree. A propenfity to generate bile, or too ftrong a difpofition to acefcency from a weaknefs of the digeftive organs, both merit attention. Whey, either from cows or goats milk, appears to be more fuitable in the former cafe; and for correcting acidity, lime-water may be added to the milk. The method of adding rum or brandy to affes or cows milk, fhould be ufed with great caution: for when added beyond a certain quantity, as is often the cafe, they not only coagulate the milk, but heat the body; by which means the former difagrees with the patient, and the fpirit augments the difeafe.

In confumptive cafes, Dr Simmons obferves, that the patient's tafte fhould be confulted; and fays that a moderate ufe of animal-food, where the falted and high-feafoned kinds are avoided, is not to be denied. Shell-fifh, particularly oyfters, are ufeful, as well as fnails fwallowed whole, or boiled in milk.

Repeated bleedings, in fmall quantities, are confidered in confumptive cafes as highly advantageous: and in particular circumftances they undoubtedly are fo; for inftance, when the conftitution apparently abounds with blood; when the fluid drawn off is extremely fizy; when there is much pain in the breaft; and

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and when venefection is followed by an abatement of every fymptom. In thefe cafes, bleeding is certainly proper, and ought to be repeated fo long as it feems to be attended with advantage. In very delicate conftitutions, however, even where the pulfe is quick, with fome degree of fulnefs, and the blood laft drawn confiderably fizy, it may not prove equally ferviceable.

It deferves to be remarked, that the inflammatory appearance of the blood is not alone a fufficient reafon for bleeding; but, in determining the propriety of this evacuation, all other circumftances fhould be confidered; fuch as the patient's age, ftrength, habit, and the ftate of the difeafe.

A remark which has been judicioufly made by Dr Fothergill, ought not to be omitted in the account of this difeafe. It is, that young delicate females, from the age of 15 or 16, and upwards, are often fubject to confumptions. When the difeafe has advanced confiderably, the *menfes*, if they have made their appearance, moft generally ceafe. This alarms their female friends, and they call upon the phyfician to ufe his utmoft endeavours for reftoring the difcharge; believing the ceffation of it to be the immediate caufe of the phthifical complaint. Induced by their folicitations, medicines have fometimes been adminiftered, which, without obtaining this end, have tended to aggravate the diftemper. This deficiency is often of no real difadvantage in thofe cafes; and in many the evacuation would prove injurious, by diminifhing the ftrength, which is already too much impaired. Even fmall bleedings at the regular periods have often done more harm than good. A fudden fuppreffion may require bleeding; but when the evacuation fails through want of ftrength, and from poverty of blood, the renewal of it increafes the difeafe.

Befides thefe remedies, Dr Simmons ftrongly recommends a frequent repetition of vomits. Many phyficians have fuppofed, that where there is any increafed determination to the lungs, vomits do mifchief: but Dr Simmons is perfuaded, that inftead of augmenting they diminifh this determination; and that much good may be expected from a prudent ufe of this remedy, than which none has a more general or powerful effect on the fyftem. If any remedy be capable of difperfing a tubercle, he believes it to be vomits The affections of the liver, that fometimes accompany pulmonary complaints, give way to repeated emetics fooner than to any other remedy. In feveral cafes where the cough and the matter expectorated, the flufhing heats, lofs of appetite, and other fymptoms, threatened the moft fatal event; the complaints were greatly relieved, and in others wholly removed, by the frequent ufe of emetics. Other fuitable remedies were indeed employed at the fame time; but the relief the patients generally experienced after the emetic, was a fufficient proof of its falutary operation. By this, however, he does not mean that vomits will be ufeful in every period of the difeafe, or in every patient. In general, it will be found that the earlier in the difeafe emetics are had recourfe to, the more likely they will be to do good and the lefs likely to do harm. The cafes in which emetics may be reckoned improper, are commonly thofe in which the difeafe is rapid in its progrefs; or in that ftage of it when there is great debility, with profufe colliquative fweats.

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In thefe cafes, when an emetic has been adminiftered twice a-week, and the cough is mitigated, the expectoration facilitated, and the other fymptoms relieved, both the patient and the phyfician will be encouraged to proceed, and to repeat the vomit every fecond day, or even every day, for feveral days together, as Dr Simmons has fometimes done when the good effects of it were obvious.

The choice of emetics to be employed in thefe cafes is by no means a matter of indifference. Carduus tea, camomile tea, warm water, and others that act by their bulk, and by exciting naufea, relax the tone of the ftomach when they are frequently repeated, and of courfe will be improper. More active emetics are therefore to be preferred; and here fome of the preparations of antimony might naturally be thought of. But the operation of thefe is not confined to the ftomach. They produce evacuations by ftool, and a difpofition to fweat; and are therefore improper in the pulmonary hectic. The mildnefs and excellence of ipecacuanha as an emetic, are well known; but in thefe cafes, Dr Simmons has often employed the blue vitriol, concerning the effects of which we meet with fome groundlefs affertions in feveral medical books. Its operation is confined to the ftomach; it acts almoft inftantaneoufly, and its aftringency feems to obviate the relaxation that is commonly fuppofed to attend the frequent ufe of emetics. In two cafes he experienced its good effects, after vomits of ipecacuanha had been given ineffectually. It fhould be adminiftered in the morning, and in the following manner:

Let the patient firft fwallow about half a pint of water, and immediately afterwards the vitriol diffolved in a cupful of water. The dofe of it muft be adapted to the age and other circumftances of the patient, and may be varied from two grains to ten, fifteen, or twenty. As fome perfons are much more eafily puked than others, it will be prudent to begin with a fmall dofe: not that any dangerous effects will be produced by a large one, for the whole of the medicine is inftantly rejected; but if the naufea be violent, and of long continuance, the patient may perhaps be difcouraged from repeating it. In general, the moment the emetic has reached the ftomach it is thrown up again. The patient muft then fwallow another half pint of water, which is likewife fpeedily rejected; and this is commonly fufficient to remove the naufea.

Dr Marryat, in his *New Practice of Phyfic*, prefcribes with great freedom what he calls the *dry vomit*, from its being directed to be taken without drinking. This medicine confifts of blue vitriol and the emetic tartar; but its good effects have not yet been afcertained by other practitioners.

Another remedy which Dr Simmons ftrongly recommends in confumptive cafes, both from his own obfervation and on the authority alfo of many other eminent practitioners, is gum myrrh. This given by itfelf to the extent of a fcruple or half a dram for a dofe, two or three times a-day, or, if there be much inflammatory tendency, combined with a proportion of nitre or of cream of tartar, has often been ferviceable

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able in cases which were apparently instances of incipient phthisis even of the tuberculous kind. But when the disease is far advanced, or even decidedly marked, as far as our experience goes it has rarely if ever been productive of any benefit.

Beside the use of internal remedies in pulmonary affections, physicians have often prescribed the steams of resinous and balsamic substances to be conveyed into the lungs. The vapour of dulcified spirit of vitriol, dropt into warm water, has likewise been used in these cases, and is advertised as a nostrum under the name of *æther*. The inhaling of fixed air has also been spoken of as an useful practice. Dr Simmons has seen all of these methods tried at different times; but without being able to perceive any real advantages from them in the suppurative stage of the disease, where they might be expected to be of the greatest use; and in the beginning he has often found the two first to be too stimulating. He therefore preferred the simple vapour of warm water, and has experienced its excellent effects in several instances; but when the complaint has made any considerable progress, its utility is less obvious; and when the patients have been much weakened, he has seen it bring on profuse sweats, especially when used in bed, and therefore generally recommended it to be used in the day-time. Formerly he made use of a fumigating machine, described in the Gentleman's Magazine for 17 8, in which the air, inspired by the patient, is made to pass through hot water by means of a tube that communicates with the external air, and with the bottom of the vessel: but we have now a more elegant and (on account of the valve and mouth-piece) a more useful instrument of this kind, the inhaler, invented by the ingenious Dr Mudge.

Another remedy recommended by some as a specific in consumptions is the earth-bath. Van Swieten, in his Commentaries on Boerhaave, tells us, from the information of a person of credit, that in some parts of Spain they have a method of curing the phthisis pulmonalis by the use of this remedy; and he quotes the celebrated Solano de Luque in confirmation of this practice. Solano speaks of the *banos de tierra*, or earth-baths, as a very old and common remedy in Granada and some parts of Andalusia, in cases of hectic fever and consumptions; and relates several instances of their good effects in his own practice. The method he adopted on these occasions was as follows: He chose a spot of ground on which no plants had been sown, and there he made a hole large and deep enough to admit the patient up to the chin. The interstices of the pit were then carefully filled up with the fresh mould, so that the earth might every where come in contact with the patient's body. In this situation the patient was suffered to remain till he began to shiver or felt himself uneasy; and during the whole process, Solano occasionally administered food or some cordial medicine. The patient was then taken out, and, after being wrapped in a linen cloth, was placed upon a matrass, and two hours afterwards his whole body was rubbed with an ointment, composed of the leaves of the *solanum nigrum* and hog's lard. He observes, that a new pit must be made every time the operation is repeated; and advises the use of these baths only from the end of May to the end of October. Dr Fouquet, an ingenious French physician, has tried this remedy in two cases. In one, a confirmed phthisis, he was unsuccessful; but the remedy had not a fair trial. The patient, a man 30 years of age, had been for several months afflicted with cough, hectic fever, and profuse colliquative sweats. He was first put into the earth in the month of June; but soon complained of an uneasy oppression at his stomach, and was removed at the end of seven minutes. The second time he was able to remain in it half an hour, and when taken out was treated in the way prescribed by Solano. In this manner the baths were repeated five times, and the patient was evidently relieved; but having conceived a dislike to the process, he refused to submit to any further trials, and died some months afterwards. In the second case he was more fortunate: the patient, a girl 11 years of age, had been for three months troubled with a cough brought on by the measles, which was at length attended with a purulent expectoration, hectic fever, and night-sweats. She began the use of the earth-bath in August, and repeated it eight times in the space of 20 days. At the end of that time the fever and disposition to sweat had entirely ceased, and by the use of the common remedies the patient was perfectly restored. A physician at Warsaw has likewise prescribed the earth-bath with good success in cases of hectic fever. The Spaniards confine it entirely to such cases; but in some other parts of the world we find a similar method employed as a remedy for other diseases, and particularly for the sea-scurvy. Dr Priestley observes, that the Indians, he has been told, have a custom of burying their patients labouring under putrid diseases up to the chin in fresh mould, which is also known to take off the fœtor from flesh-meat beginning to putrefy. The rancidity of a ham, for example, may be corrected by burying it for a few hours in the earth. The efficacy of this remedy in the sea-scurvy has, it is said, frequently been experienced by the crews of our East India ships.

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Solano, who is fond of philosophizing in his writings, is of opinion, that the earth applied in this way absorbs the morbid taint from the system: but does it not seem more probable, that the effluvia of the earth, by being absorbed and carried into the circulation, corrects the morbid state of the fluids, and thus are equally useful in the sea-scurvy and in the pulmonary hectic? That the earth when moistened does emit a grateful odour is a fact generally known; and Baglivi long ago gave his testimony in favour of the grateful effects of the effluvia of fresh earth. He ascribes these good effects to the nitre it contains.

The earth-bath, both in consumptive cases and likewise in a variety of other affections, has of late been extensively employed in Britain by a celebrated empiric. But, as far as we can learn, in most cases it produced to the patient a very distressing sensation of cold; in some, it seemed to be productive of bad effects, probably in consequence of this cold; and we have not heard of any consumptive cases in which good effects were decidedly obtained from it.

With regard to the drains, such as blisters, issues, and setons, that are so frequently recommended in pulmonary complaints, there is less danger of abuse from them than from the practice of venesection. The discharge they excite is not calculated to weaken the patient

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tient much; and the relief they have so often been found to afford, is a sufficient reason for giving them a trial. Blisters, as is well known, act in a twofold manner; by obviating spasm, and producing revulsion: Issues and setons act chiefly in the latter of these two ways; and in this respect their effects, though less sudden and less powerful at first, are more durable from the continuance of the discharge they occasion. It is perhaps hardly necessary to remark, that, if much service is to be expected from either of these remedies, they should be applied early in the disease. The ingenious Dr Mudge, who experienced the good effects of a large scapulary issue on his own person, very properly observes, that the discharge in these cases ought to be considerable enough to be felt. But it is seldom possible for us to prevail on the delicate persons, who are most frequently the victims of this disease, to submit to the application of a caustic between the shoulders. The discharge produced by a seton is by no means inconsiderable; and as in these cases there is generally some inflammatory stitch, some part of the breast that is more painful or more affected by a deep inspiration than the rest, a seton in the side, as near as can be to the seat of the inflammation, will be an useful auxiliary. Dr Simmons has seen it evidently of great use in several cases.

240 GENUS XXXVIII. HÆMORRHOIS.
HEMORRHOIDS, or PILES.

Hæmorrhois, *Sauv.* gen. 217. *Lin.* 192. *Sag.* gen. 182
Hæmorrhoidalis fluxus. *Hoffm.* 219.
Hæmorrhoides, *Junck.* 11. and 12.
Leucorrhois, *Vog.* 112

241 Sp. I. *External* PILES.
Var. A. *Bloody* PILES.

Hæmorrhois moderata, *Sauv.* sp. 1.
Hæmorrhoides ordinatæ, *Junck.* 11.
Hæmorrhoides nimiæ, *Junck.* 11.
Hæmorrhois immodica, *Sauv.* sp. 2.
Hæmorrhoides excedentes, *Alberti.* de hæmorrhoid. p. 179
Hæmorrhois polyposa. *Sauv.* sp. 3.

Var. B. *Mucous* PILES.

Hæmorrhoides decoloratæ, albæ, et mucidæ, *Junck.* 13. *Alberti,* p. 248.

242 SP. II. The PILES from a *Procidentia Ani.*

Hæmorrhois ab exania, *Sauv.* sp. 4.

243 Sp. III. The *Running* PILES.

244 Sp. IV. The *Blind* PILES.

Hæmorrhoides cœcæ, *Junck.* 12. *Alberti,* p. 274.

Description. The discharge of blood from small tumors on the verge of the anus constitutes what is called the *hæmorrhoids* or *piles.* They are distinguished into the *external* and *internal*, according to the situation of the tumors, either without or within the anus. Sometimes, however, these tumors appear without discharging any blood; and in this case they are called the *hæmorrhoides cœcæ* or *blind piles.* Sometimes the disease appears without the verge of the anus in distinct separate tumors; but frequently only one tumid ring appears, seeming as it were the anus pushed without the body. Sometimes these tumors appear without any previous disorder of the body: but more frequently, before the blood begins to flow, and sometimes even before the tumors are formed, various affections are perceived in different parts of the body; as headach, vertigo, stupor, difficulty of breathing, sickness, colic pains, pain of the back and loins, and frequently a considerable degree of pyrexia; while along with these symptoms there is a sense of fullness, heat, itching, and pain, in and about the anus. Sometimes the disease is preceded by a serous discharge from the anus; and sometimes this serous discharge, accompanied with swelling, seems to come in place of the discharge of blood, and to relieve the above-mentioned disorders of the system. This serous discharge hath therefore been named the *hæmorrhois alba.*

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In this disease the quantity of blood discharged is different upon different occasions. Sometimes it flows only when the person goes to stool, and commonly follows the discharge of fæces. In other cases it flows without any discharge of fæces; and then generally in consequence of the disorders above-mentioned, when it is also commonly in larger quantity. This is often very considerable; and, by the repetition, so great, that we could hardly suppose the body to bear it but with the hazard of life. Indeed, though rarely, it has been so great as to prove suddenly fatal. These considerable discharges occur especially to persons who have been frequently liable to the disease. They often induce great debility, and frequently a leucophlegmatia or dropsy which proves fatal. Sometimes the tumors and discharges of blood in this disease recur exactly at stated periods. In the decline of life it frequently happens that the hæmorrhoidal flux, formerly frequent, ceases to flow; and in that case it generally happens that the persons are affected with apoplexy or palsy. Sometimes hæmorrhoidal tumors are affected with inflammation, which ends in suppuration, and gives occasion to the formation of fistulous ulcers in those parts.

The hæmorrhoidal tumors have often been considered as varices or dilatations of the veins; and in some cases varicous dilatations have appeared upon dissection. These, however, do not appear in the greater part of cases; and Dr Cullen is of opinion that they are usually formed by an effusion of blood into the cellular texture of the intestine near to its extremity. When recently formed, they contain fluid blood: but after they remain for some time they are usually of a firmer consistence, in consequence of the blood being coagulated.

Causes, &c. It would seem probable, that the hæmorrhoidal tumors are produced by some interruption of the free return of the blood from the rectum, by which a rupture of the extremities of the veins is occasioned. But considering that the hæmorrhagy occuring here is often preceded by pain, inflammation, and a febrile state, and with many other symptoms which show a connection of the topical affection with the state of the whole system, it is probable that the interruption of the blood in the veins produces

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produces a considerable resistance to the motion of the blood through the arteries, and consequently that the discharge of blood is commonly from the latter. Some have thought, that a difference of the hœmorrhois, and of its effects upon the system, might arise from the difference of the hæmorrhoidal vessels from whence the blood issued. But Dr Cullen is of opinion, that we can scarce ever distinguish the vessels from which the blood flows, and that the frequent inosculations of both arteries and veins belonging to the lower extremity of the rectum, will render the effects of the hæmorrhagy much the same, from whatever source it proceeds.

With regard to the hæmorrhoids, however, he is of opinion, that they are, for the most part, merely a topical affection. They take place before the period of life at which a venous plethora happens. They happen to females, in whom a venous plethora determined to the hæmorrhoidal vessels cannot be supposed to occur; and they happen to both sexes, and to persons of all ages, from causes which do not affect the system, and are manifestly suited to produce a topical affection only.

These causes are, in the first place, the frequent voiding of hard and bulky fæces, which, by their long stagnation in the rectum, and especially when voided, must necessarily press upon the veins of that part, and interrupt the course of the blood in them. For this reason the disease so frequently happens to those who are habitually costive. From the same causes, the disease happens frequently to those who are subject to a prolapsus ani. In voiding the fæces, it almost always happens that the internal coat of the rectum is more or less protruded; and, during this protrusion, it sometimes happens that the sphincter ani is contracted: in consequence of this, a strong constriction is made, which preventing the fallen-out gut from being replaced, and at the same time preventing the return of blood from it, occasions a considerable swelling, and the formation of a tumid ring round the anus.

Upon the sphincter's being a little relaxed, as it is immediately after its strong contraction, the portion of the gut which had fallen out is commonly taken into the body again; but by the frequent repetition of the accident, the size and fulness of the ring formed by the prolapsed intestine is much increased. It is therefore more slowly and difficultly replaced; and in this consists the chief uneasiness of hæmorrhoidal persons. As the internal edge of this ring is necessarily divided by clefts, the whole often puts on the appearance of a number of distinct swellings; and it also frequently happens, that some portions of it are more considerably swelled, become more protuberant, and form those small tumors more strictly called *hæmorrhoids* or *piles*.

From considering that the pressure of the fæces, and other causes interrupting the return of venous blood from the lower extremity of the rectum, may operate a good deal higher up than that extremity, we may understand how tumors may be formed within the anus; and probably it also happens, that some of the tumors formed without the anus may continue when taken within the body, and even be increased by the causes just mentioned. Thus may the production of internal piles be explained, which, on account of their situation and bulk, are not protruded on the person's going to stool, and are therefore more painful.

The production of piles is particularly illustrated by this, that pregnant women are frequently affected with the disease.—This is to be accounted for, partly from the pressure of the uterus upon the rectum, and partly from the costive habit to which pregnant women are liable. Dr Cullen has known many instances of piles happening for the first time during the state of pregnancy; and there are few women who have born children, that are afterwards entirely free from piles. —Purgatives also, especially those of the more acrid kind, and particularly aloetics, are apt to produce the piles when frequently used; and as they stimulate particularly the larger intestines, they may be justly reckoned among the exciting causes of this disease.

Prognosis. Though the hæmorrhoids are commonly, as we have said, to be esteemed a topical disease, they may, by frequent repetition, become habitual and connected with the state of the whole system; and this will more readily happen in persons who have been once affected with the disease, if they be frequently exposed to a renewal of the causes which occasioned it. It happens also to persons much exposed to a congestion in the hæmorrhoidal vessels, in consequence of their being often in an erect position of the body, and in an exercise which pushes the blood into the depending vessels, while at the same time the effects of these circumstances are much favoured by the abundance and laxity of the cellular texture about the anus. It is to be particularly observed, that when an hæmorrhoidal affection has either been originally or has become a disease of the system, it then acquires a particular connection with the stomach; so that certain affections of the stomach excite the hæmorrhoidal disease, and certain states of this disease excite the disorders of the stomach.

It has been an almost universally received opinion, that the hæmorrhoidal flux is a salutary evacuation, which prevents many diseases that would otherwise have happened; and that it even contributes to give long life: and as this opinion has been strenuously adopted by Dr Stahl, it has had a very considerable influence on the practice of physic in Germany. But Dr Cullen maintains that we can never expect to reap much benefit from this flux, which at first is purely topical; and, granting that it should become habitual, it is never, he thinks, proper to be encouraged. It is a disagreeable disease; ready to go to excess, and thereby to prove hurtful, and sometimes even fatal. At best it is liable to accidents, and thus to unhappy consequences. He is therefore of opinion, that even the first approaches of the disease are to be guarded against; and that, though it should have proceeded for some time, it ought always to be moderated, and the necessity of it superseded

Cure. The general intentions of cure in cases of hœmorrhois are much varied, according to the circumstances of the affection at the time. When hæmorrhois exists in the state of tumor, the principal objects are to counteract inflammation, and to promote a discharge of blood from the part. When it is in the state

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ſtate of evacuation, the chief intentions of cure are, to diminiſh the impetus of blood at the part affected, and to increaſe the reſiſtance to the paſſage of blood through the ruptured veſſels. And finally, when the diſeaſe exiſts in the ſtate of ſuppreſſion, the aims of the practitioner muſt chiefly be, to obviate the particular affections which are induced in conſequence of the ſuppreſſion; to reſtore the diſcharge, as a means of mitigating theſe and preventing others; or, when the diſcharge cannot with propriety or advantage be reſtored, to compenſate the want of it by vicarious evacuations.

With theſe various intentions in different caſes, a variety of different remedies may be employed with advantage.

When any evident cauſe for this diſeaſe is perceived, we ought immediately to attempt a removal of that cauſe. One of the moſt frequent remote cauſes is an habitual coſtiveneſs; which muſt be obviated by a proper diet, ſuch as the perſon's own experience will beſt direct; or if the management of diet be not effectual, the belly muſt be kept open by medicines, which may prove gently laxative, without irritating the rectum. In moſt caſes it will be of advantage to acquire a habit with regard to the time of diſcharge, and to obſerve it exactly. Another cauſe of the hæmorrhois to be eſpecially attended to is the prolapſus ani, which is apt to happen on a perſon's having a ſtool. If this ſhall occur to any conſiderable degree, and be not at the ſame time eaſily and immediately replaced, it moſt certainly produces piles, or increaſes them when otherwiſe produced. Perſons therefore who are liable to this prolapſus, ſhould, after having been at ſtool, take great pains to have the inteſtine immediately replaced, by lying down in an horizontal poſture, and preſſing gently upon the anus, till the reduction ſhall be completely obtained. When this prolapſus is occaſioned only by the voiding of hard and bulky fæces, it is to be removed by obviating the coſtiveneſs which occaſions it. But in ſome perſons it is owing to a laxity of the rectum; and in thoſe it is often moſt conſiderable on occaſion of a looſe ſtool. In theſe caſes, it is to be treated by aſtringents, and proper artifices are to be employed to keep the gut in its place.

When the diſeaſe has frequently recurred from neglect, and is thus in ſome meaſure eſtabliſhed, the methods above-mentioned are no leſs proper; but in this caſe ſome other meaſures muſt alſo be uſed. It is eſpecially proper to guard againſt a plethoric ſtate of the body; and therefore to avoid a ſedentary life, full diet, and intemperance in the uſe of ſtrong liquor, which in all caſes of hæmorrhagy is of the moſt pernicious conſequence.

Exerciſe of all kinds is of great ſervice in obviating and removing a plethoric ſtate of the body; but upon occaſion of the hæmorrhoidal flux, when this is immediately to come on, both walking and riding, as increaſing the determination of the blood into the hæmorrhoidal veſſels, are to be avoided. At other times, when no ſuch determination is already formed, theſe modes of exerciſe may be very properly employed.

Another method of removing plethora is by cold bathing; but this muſt be employed with caution. When the hæmorrhoidal flux is approaching, it may be dangerous to divert it; but during the intervals of the diſeaſe, cold bathing may be employed with ſafety and advantage; and in thoſe who are liable to a prolapſus ani, the frequent waſhing of the anus with cold-water may be uſeful.

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Beſides general antiphlogiſtic regimen, in ſome caſes where the inflammation runs high, recourſe may be had with great advantage both to general blood-letting and to leeches applied at the anus. Relief is alſo often obtained from the external application of emollients, either alone or combined with different articles of the ſedative kind, as acetated ceruſe or opium, by which it is well known that pain in general, particularly when depending on increaſed ſenſibility, or augmented action of the veſſels, is powerfully allayed.

When the flux has actually come on, we are to moderate it as much as poſſible, by cauſing the patient lie on a horizontal poſture on a hard bed; by avoiding exerciſe in an erect poſture, uſing a cool diet, and avoiding external heat. But with reſpect to the further cure of this diſeaſe, we muſt obſerve, that there are only two caſes in which it is common for hæmorrhoidal perſons to call for medical aſſiſtance. The one i, when the affection is accompanied with much pain; and the other, when the piles are accompanied with exceſſive bleeding. In the firſt caſe, we muſt conſider whether the piles be external or internal. The pain of the external piles happens eſpecially when a conſiderable protruſion of the rectum has taken place; and while it remains unreduced, it is ſtrangled by the conſtriction of the ſphincter; and at the ſame time no bleeding happens to take off the ſwelling of the protruded portion of the inteſtine; and ſometimes an inflammation ſupervenes, which greatly aggravates the pain. In this caſe, emollient fomentations and poultices are ſometimes of ſervice, but the application of leeches is generally to be preferred.

In caſe of exceſſive bleeding, we are on all occaſions to endeavour to moderate the flux, even where the diſeaſe has occurred as a critical diſcharge; for if the primary diſeaſe ſhall be entirely and radically cured, the preventing any return of the hæmorrhois ſeems perfectly ſafe and proper. It is only when the diſeaſe ariſes from a plethoric habit, and from a ſtagnation of blood in the hypochondriac region, or when, though originally topical, it has by frequent repetition become habitual, and has thereby acquired a connection with the ſyſtem, that any doubt can ariſe about curing it entirely. In any of theſe caſes, however, Dr Cullen is of opinion that it will be proper to moderate the bleeding, leſt, by its continuance or repetition, the plethoric ſtate of the body, and the particular determination of the blood into the hæmorrhoidal veſſels, be increaſed, and the return of the diſeaſe be too much favoured. Dr Stahl is of opinion, that the hæmorrhoidal flux is never to be accounted exceſſive excepting when it occaſions great debility or leucophlegmatia: but Dr Cullen thinks, that the ſmalleſt approach towards producing either of theſe effects ſhould be conſidered as an exceſs which ought to be prevented from going farther; and even in the caſes of congeſtion and plethora, if the plethoric habit and tendency can be obviated and removed, the hæmorrhoidal flux may then with ſafety be entirely ſuppreſſed. In all caſes therefore of exceſſive bleeding, or any ap-

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proach to it, aftringents both internal and external may be fafely and properly applied; not indeed to induce an immediate and total fuppreffion; but to moderate the hæmorrhagy, and by degrees to fupprefs it altogether; while at the fame time meafures are to be taken for the removing the neceffity of its recurrence.

245 GENUS XXXIX. MENORRHAGIA.
Immoderate Flow of the MENSES.

Menorrhagia, *Sauv.* 244. *Lin.* 202. *Vog.* 96.
Metrorrhagia, *Sag.* gen. 179.
Uteri hæmorrhagia, *Hoffm.* II. 224.
Hæmorrhagia uterina, *Junck.* 14.
Leucorrhœa, *Sauv* gen. 267. *Lin.* 201. *Vog.* 119. *Sag.* gen. 202.
Cachexia uterina, five fluor albus, *Hoffm.* III. 348.
Fluor albus, *Junck* 133.
Abortus, *Sauv.* gen. 245. *Lin.* 204. *Sag.* gen. 180. *Junck.* 92.
Abortio, *Vog.* 97.
Fluor uterini fanguinis, *Boerh.* 1303.
Convulfio uteri, five abortus, *Hoffm.* III. 176.

246 Sp. I. The *Immoderate Flow* of the MENSES, properly fo called.

Menorrhagia rubra, *Cul.*
Menorrhagia immodica, *Sauv.* fp. 3.
Menorrhagia ftillatitia, *Sauv.* fp 2.

Defcription. The quantity of the menftrual flux is different in different women, and likewife in the fame woman at different times. An unufual quantity therefore is not always to be confidered as morbid: but when a large flow of the menfes has been preceded by headach, giddinefs, or dyfpnœa; has been ufhered in by a cold ftage, and is attended with much pain of the back and loins, with a frequent pulfe, heat and thirft; it may then be confidered as preternaturally morbid. On the other hand, when the face becomes pale, the pulfe weak, an unufual debility is felt in exercife, and the breathing is hurried by little labour; when the back becomes pained from any continuance in an erect pofture, when the extremities become frequently cold, and when at night the feet appear affected with œdematous fwelling: from all thefe fymptoms we may conclude, that the flow of the menfes has been immoderate, and has already induced a dangerous ftate of debility. The debility, induced in this cafe, often appears alfo by affections of the ftomach, an anorexia, and other fymptoms of dyfpepfia; by a palpitation of the heart, and frequent faintings; by a weaknefs of mind, liable to ftrong emotions from flight caufes, efpecially thofe prefented by furprife. A large flow of the menfes attended with barrennefs in married women, may generally be confidered as preternatural and morbid. Generally, alfo, that flow of the menfes may be confidered as immoderate, which is preceded and followed by a leucorrhœa.

Caufes, &c. The proximate caufe of the menorrhagia is either the effort of the uterine veffels preternaturally increafed, or a preternatural laxity of the extremities of the uterine arteries.—The remote caufes may be, 1. Thofe which increafe the plethoric ftate of the uterine veffels; as a full and nourifhing diet, much ftrong liquor, and frequent intoxications. 2. Thofe which determine the blood more copioufly and forcibly into the uterine veffels; as violent ftrainings of the whole body; violent fhocks from falls; ftrokes or contufions on the lower belly; violent exercife, particularly in dancing; and violent paffions of the mind. 3. Thofe which particularly irritate the veffels of the uterus: as excefs in venery; the exercife of venery in the time of menftruation; a coftive habit, giving occafion to violent ftraining at ftool; and cold applied to the feet. 4. Thofe which have forcibly overftrained the extremities of the uterine veffels; as frequent abortions, frequent child-bearing without nurfing, and difficult or tedious labours. Or, laftly, thofe which induce a general laxity; as living much in warm chambers, and drinking much of warm enervating liquors, fuch as tea, coffee, &c.

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Cure. The treatment and cure of the menorrhagia, muft be different according to the different caufes of the difeafe. The practices employed, however, are chiefly ufed with one or two intentions; either with the view of reftraining the difcharge when prefent, or of preventing the return of an exceffive difcharge at the fucceeding period. The firft is chiefly to be accomplifhed by employing fuch practices as diminifh the force occafioning the difcharge of blood, or as augment the refiftance to its paffage through the veffels by which it is to be difcharged. The laft is in fome degree to be obtained by avoiding caufes which either increafe the general impetus of the blood, or the impetus at the uterus in particular; but principally by giving additional vigour to the uterine veffels.

In all cafes, the firft attention ought to be given to avoiding the remote caufes, whenever that can be done; and by fuch attention the difeafe may be often entirely cured. When the remote caufes cannot be avoided, or when the avoiding them has been neglected, and a copious menftruation has come on, it fhould be moderated as much as poffible, by abftaining from all exercife at the coming on or during the continuance of the menftruation; by avoiding even an erect pofture as much as poffible; by fhunning external heat, and of courfe warm chambers and foft beds; by ufing a light and cool diet; by taking cold drink, at leaft as far as former habits will allow; by avoiding venery; by obviating coftivenefs, or removing it by laxatives which give little ftimulus. The fex are commonly negligent, either in avoiding the remote caufes, or in moderating the firft beginnings of this difeafe. It is by fuch neglect that it fo frequently becomes violent and of difficult cure; and the frequent repetition of a copious menftruation may be confidered as a caufe of great laxity in the extreme veffels of the uterus.

When the coming on of the menftruation has been preceded by fome diforder in other parts of the body, and is accompanied with pains of the back, fomewhat like parturient pains, with febrile fymptoms, and when at the fame time the flow feems to be copious, a bleeding at the arm may be proper, but is not often neceffary; and it will in moft cafes be fufficient to employ, with great attention and diligence, thofe means already mentioned for moderating the difcharge.

When the immoderate flow of the menfes fhall feem

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to be owing to a laxity of the veſſels of the uterus, as may be concluded from the general debility and laxity of the perſon's habit; from the remote cauſes that have occaſioned the diſeaſe; from the abſence of the ſymptoms which denote increaſed action in the veſſels of the uterus; from the frequent recurrence of the diſeaſe; and particularly from this, that the female in the intervals of menſtruation is liable to a leucorrhœa: in ſuch a caſe, the diſeaſe is to be treated, not only by employing all the means above mentioned for moderating the hemorrhagy, but alſo by avoiding all irritation, every irritation having a greater effect in proportion as the veſſels are more lax and yielding. If, in ſuch a caſe of laxity, it ſhall appear that ſome degree of irritation concurs, opiates may be employed to moderate the diſcharge; but in uſing theſe much caution is requiſite. If, notwithſtanding theſe meaſures having been taken, the diſcharge ſhall prove very large, aſtringents both external and internal may be employed. In ſuch caſes, Dr Cullen aſks, May ſmall doſes of emetics be of ſervice?

When the menorrhagia depends on the laxity of the uterine veſſels, it will be proper, in the intervals of menſtruation, to employ tonic remedies; as cold bathing and chalybeates. The exerciſes of geſtation alſo may be very uſeful, both for ſtrengthening the whole ſyſtem, and for taking off the determination of the blood to the internal parts.

Theſe remedies may be employed in all caſes of menorrhagia, from whatever cauſe it may have proceeded, if it ſhall have already induced a conſiderable degree of debility in the body.

247 Sp. II. Abortion.

Menorrhagia abortus, *Cul.*
Menorrhagia gravidarum, *Sauv.* ſp. 6.
Abortus effluxio, *Sauv.* ſp. 1.
a. Abortus ſubtrimeſtris.
b. Abortus ſubſemeſtris.
c. Abortus octimeſtris.
Abortus ab uteri laxitate, *Sauv.* ſp. 2.

248 Sp. III. *Immoderate Flux* of the Lochia.

Menorrhagia lochialis, *Sauv.* ſp. 8. *Cul.*

For the deſcription, treatment, and cure, of theſe two laſt diſeaſes, ſee the article Midwifery.

249 Sp. IV. *Immoderate Flow* of the Menses from ſome Local Diſorder.

Menorrhagia vitiorum, *Cul.*
Menorrhagia ex hyſteroptoſi, *Sauv.* ſp. 5.
Menorrhagia ulceroſa, *Sauv.* ſp. 9

250 Sp. V. The *Leucorrhœa*, *Fluor Albus*, or *Whites*.

Menorrhagia alba, *Cul.*
Leucorrhœa, *Sauv.* G 267.
Menorrhagia decolor, *Sauv.* ſp 7.
Leucorrhœa Americana, *Sauv.* ſp. 5.
Leucorrhœa Indica, *Sauv.* ſp. 6.
Leucorrhœa Nabothi, *Sauv.* ſp. 9.
Leucorrhœ gravidarum, *Sauv.* ſp. 8.

Deſcription. The *fluor albus*, female weakneſs, or *whites*, as it is commonly called, is a diſeaſe of the womb and its contiguous parts; from which a pale coloured, greeniſh, or yellow fluid, is diſcharged, attended with loſs of ſtrength, pain in the loins, bad digeſtion, and a wan ſickly aſpect.

Leucorrhœa.

Cauſes, &c. The quantity, colour, and conſiſtence of the diſcharge, chiefly depend upon the time of its duration, the patient's habit of body, and the nature of the cauſe by which it was produced. Taking cold, ſtrong liquor, immoderate heat and moiſture, or violent exerciſe, are all obſerved to produce a bad effect, as to its quantity and quality.

Weakly women of lax ſolids, who have had many children, and long laboured under ill health, are of all the moſt ſubject to this diſagreeable diſeaſe; from which they unfortunately ſuffer more ſevere penance than others, as the niceſt ſenſations are often connected with ſuch a delicacy of bodily frame as ſubjects them to it.

In Holland it is very frequent, and in a manner peculiar to the place, from the dampneſs of its ſituation; the ſurrounding air being ſo overcharged with moiſture as to relax the body, ſtop perſpiration, and throw it upon the bowels or womb; producing in the firſt a diarrhœa or flux, in the laſt the *fluor albus* or female weakneſs.

The diſcharge often proceeds from the veſſels ſubſervient to menſtruation; becauſe, in delicate habits, where thoſe veſſels are weak, and conſequently remain too long uncontracted, the *fluor albus* ſometimes immediately follows the menſes, and goes off by degrees as they gradually cloſe. It alſo comes from the mucus glands of the womb, as is particularly evident in very young females of eight and ten years old; in whom, though very rarely, it has been obſerved, and where it muſt then neceſſarily have eſcaped from thoſe parts, as the uterine veſſels are not ſufficiently enlarged for its paſſage at ſo early a period.

Sometimes, as in women with child, it proceeds from the paſſage to the womb, and not from the womb itſelf; which, during pregnancy, is cloſely ſealed up, ſo that nothing can paſs from thence till the time of labour. The application of thoſe inſtruments called *peſſaries*, from the pain and irritation they occaſion, are alſo apt to bring on this diſcharge. Hence we may conclude, that this diſeaſe may happen although the blood be in a pure ſtate. Here the fault ſeems to be placed in the veſſels at the part, by which the fluids are vitiated and changed from their natural qualities.

The *fluor albus* has been ſuppoſed to ſupply the want of the menſes; becauſe where the firſt prevails, the laſt is generally either irregular or totally wanting: but it might more properly be ſaid, that the preſence of the *fluor albus*, which is a preternatural evacuation, occaſions the abſence of that which is natural; as is evident from the return of the menſes after the *fluor albus* has been cured. Indeed, when this diſcharge appears about the age of 13 or 14, and returns once a month, with ſymptoms like thoſe of the menſes, then it may be deemed ſtrictly natural, and therefore ought not to be ſtopped.

Prognoſis. The *fluor albus* may be diſtinguiſhed into two kinds. The firſt ariſes from a ſimple weakneſs, or the relaxation of the ſolids; which may either be *general*, where the whole bodily ſyſtem is enervated and unſtrung; or *partial*, where the womb only is thus affected, Hæmorrhage

affected, in consequence of hard labour, frequent miscarriages, a suppression or immoderate quantity of the menses, or a sprain of the back or loins.

In the first case, the discharge being generally mild, may be safely taken away. In the second, it may proceed from a vitiated or impure blood, where the body, from thence, is loaded with gross humours, which nature for her own security and relief thus endeavours to carry off. In such cases, the discharge is often of a reddish colour, like that from old ulcerous sores; being sometimes so sharp as to excoriate the contiguous parts, and occasion a smarting and heat of urine.

A deep-seated, darting pain, with a forcing down, attending such a discharge, is a very dangerous and alarming sign, and indicates an ulceration or cancerous state of the womb. This malignant state of the disease, if of long continuance, is extremely difficult of cure; and disposes the patient to barrenness, a bearing down, dropsy, or consumption.

Cure, &c. The causes of those two kinds of this disease being different, so they will require a very different method of cure. For this purpose, in the first case, nothing will be more proper than nourishing simple food; such as veal broths, jellies, fresh eggs, and milk diet. The acid fruits will also be proper; and the patient may take a restorative, strengthening infusion, which will give firmness to the body, and assist the weakened fibres of the womb in returning to their natural state.

The same method may be used with success, where the *fluor albus* follows the menses, as already observed.

The Tunbridge or Spa waters may be drank at the same time; and if necessary, an infusion of green tea, or pure smith's forge water, may be used with a womb-syringe as an injection twice a-day. Should the disease prove uncommonly obstinate, the patient may go into the cold bath every second day; and also drink lime-water with milk, which will expedite the cure, and prevent a relapse. Volatile liniment, and afterwards a strengthening plaster, may be applied to the small of the back.

By way of caution, the female should abstain from the immoderate use of tea; and be removed into a dry clear air; or if she be obliged to remain in one less proper, she may apply the flesh-brush, and wear a flannel shift next her skin, impregnated with the fumes of burning frankincense or any of the grateful aromatic gums. Cold spring-water pumped on the loins, or a blistering plaster applied to the bottom of the spine or back, are both very powerful in their effects, and have sometimes succeeded after other remedies had been tried in vain.

In the second sort of the disease, where the discharge is sharp and of long standing, it would be extremely dangerous to suppress it suddenly, either by astringents internally taken, or applied as injections, until the system be restored to a more sound and vigorous condition.

A purging potion may be taken twice a-week, and in the intervals an alterative pill night and morning. After this course has been continued a fortnight or three weeks, she may begin with the strengthening bitter infusion, or some other tonic, in the quantity of a tea-cupful twice a-day, or to a greater extent if the stomach will allow.

Leucorrhœa

The same sort of food and regimen will here be proper as in the first kind of the disease. The patient should abstain from malt liquors, and drink rice-water, in each pint of which half an ounce of gum-arabic has been dissolved; or if she be weak, and of a cold bloated habit of body, a little French brandy may be added occasionally.

When she begins to take the bitter infusion, it will be proper to use the Tunbridge or Pyrmont water for common drink; but if those cannot conveniently be had, the *artificial aërated water*, impregnated with iron and fixed air, will make an excellent substitute. If it should render her costive, and occasion head-ach, she may desist, and drink imperial water or a little senna-tea sweetened with manna, till those complaints be removed.

In short, as this is a malady of the most disagreeable kind, which by long continuance or neglect becomes difficult of cure and often produces an *ulceration of the womb*, *bearing down*, *barrenness*, a *dropsy*, or *consumption*; it were to be wished that women, on such occasions, would be more attentive to their own safety, by using all possible means, in due time, to prevent those disorders.

Dr Leake says he has attended more patients labouring under the *fluor albus* in the autumn than at any other season of the year, especially when the weather was uncommonly moist and cold: most of them were cured by change of diet, an increased perspiration, and the proper use of Peruvian bark with aromatics. He observed, that several about this time who escaped the disorder, were visited with bad colds, a defluxion on the throat, or a diarrhœa, which were removed by a similar treatment.

As women are sometimes connected with those who do not conscientiously regard their safety, it is a circumstance of the utmost consequence *to distinguish a fresh venereal infection from the fluor albus or whites:* for if the first be mistaken for the last, and be either neglected or improperly treated, the worst consequences may arise.

The following signs will best inform the patient whether there be occasion for her doubts or not.

A fresh infection, called *gonorrhœa*, is malignant and inflammatory; the *fluor albus* most commonly arises from relaxation and bodily weakness: and therefore the remedies proper in the first disorder would render the last more violent, by locking up and confining the infectious matter.

In the gonorrhœa, the discharge chiefly proceeds from the parts contiguous to the urinary passage, and continues whilst the menses flow; but in the *fluor albus* it is supplied from the cavity of the womb and its passage, and then the menses are seldom regular.

In the gonorrhœa, an itching, inflammation, and heat of urine, are the fore-runners of the discharge; the orifice of the urinary passage is prominent and painful, and the patient is affected with a frequent irritation to make water. In the *fluor albus*, pains in the loins, and loss of strength, attend the discharge; and if any inflammation or heat of urine follow, they happen in a less degree, and only after a long con-

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tinuance of the discharge, which, becoming sharp and acrimonious, excoriates the surrounding parts.

In the gonorrhœa, the discharge suddenly appears without any evident cause; but in the *fluor albus*, it comes on more slowly, and is often produced by irregularities of the menses, frequent abortion, sprains, or long-continued illness.

In the gonorrhœa, the discharge is greenish or yellow, less in quantity, *and not attended with the same symptoms of weakness*. In the *fluor albus*, it is also often of the same colour, especially in bad habits of body, and after long continuance; but is usually more offensive, and redundant in quantity.

All the other kinds of hemorrhagy enumerated by medical writers, are by Dr Cullen reckoned to be symptomatic; as,

Stomacace, *Sauv.* gen. 241. *Lin.* 175. *Vog.* 85. *Sag.* gen. 176.

Species: Scorbutica, Purulenta, &c.

Hæmatemesis, *Sauv.* gen. 242. *Lin.* 184. *Vog.* 89. gen. 177.

Species: Plethorica, Catamenialis, Scorbutica, &c.

Hæmaturia, *Sauv.* gen. 233. *Lin.* 198. *Vog.* 92. *Sag.* gen. 178.

Species: Purulenta, Calculosa, Hæmorrhoidalis, &c.

Order V. PROFLUVIA.

Genus XL. CATARRHUS.
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Catarrhus, *Sauv.* gen. 186. *Vog.* 98. *Sag.* gen. 145.
Coryza, *Lin.* 174. *Vog.* 100. *Sag.* gen. 196.
Rheuma, *Sauv.* gen. 142.
Tussis, *Sauv.* gen. 142. *Lin.* 155. *Vog.* 205. *Sag.* gen. 245. 255. *Junck.* 30.
Tussis catarrhalis et rheumatica, *Hoffm.* III. 109.

252 Sp. I. *Catarrh* from Cold.

Catarrhus a frigore, *Cul.*
Catarrhus benignus, *Sauv.* sp. 1.
Catarrhus pectoreus, *Sauv.* sp. 6.
Coryza catarrhalis, *Sauv.* sp. 1.
Coryza phlegmatorrhagia, *Sauv.* sp. 2. *Salmuth.* Obs. cent. 1. 37. *Junck.* 28. *Morgagn.* de sed. xiv. 21.
Coryza febricosa, *Sauv.* sp. 6.
Tussis catarrhalis, *Sauv.* sp. 1. *N. Rosen* Diss. apud *Haller*, Disput. Pract. tom. II.
Rheuma catarrhale, *Sauv.* sp 1.
Amphimerina catarrhalis, *Sauv.* sp. 2.
Amphimerina tussiculosa, *Sauv.* sp. 13.?
Cephalalgia catarrhalis, *Sauv.* sp. 10.

253 Sp. II. *Catarrh* from Contagion.

Catarrhus a contagio, *Cul.*
Catarrhus epidemicus, *Sauv.* sp. 3.
Rheuma epidemicum, *Sauv.* sp. 2.
Synocha catarrhalis, *Sauv.* sp. 5.

There are several symptomatic species: as, Catarrhus Rubeolosus; Tussis Variolosa, Verminosa, Calculosa, Phthisica, Hysterica, a dentitione, Gravidarum, Metallicolarum, &c.

Catarrhus.

Description. The catarrh is an increased excretion of mucus from the mucous membrane of the nose, fauces, and bronchiæ, attended with pyrexia.

Practical writers and nosologists have distinguished the disease by different appellations, according as it happens to affect different parts of the mucous membrane, one part more or less than the other: but Dr Cullen is of opinion that the disease in those different parts is always of the same nature, and proceeds from the same cause in the one as in the other. Very commonly indeed those different parts are affected at the same time; and therefore there is little room for the distinction mentioned. The disease has been frequently treated of under the title of *tussis* or *cough*; and a cough, indeed, always attends the chief form of catarrh, that is, the increased excretion from the bronchiæ; but as it is so often also a symptom of many other affections, which are very different from one another, it is improperly used as a generic title.

The disease generally begins with some difficulty of breathing through the nose, and with a sense of some fulness stopping up that passage. This again is often attended with some dull pain and a sense of weight in the forehead, as well as a stiffness in the motion of the eyes. These feelings, sometimes at their very first beginning, and always soon after, are attended with the distillation of a thin fluid from the nose, and sometimes from the eyes; and these fluids are often found to be somewhat acrid, both by their taste and by their fretting the parts over which they pass. These symptoms constitute the coryza and gravedo of authors, and are commonly attended with a sense of lassitude over the whole body. Sometimes cold shiverings are felt; at least the body is more sensible than usual to the coldness of the air; and with all this the pulse is more frequent than ordinary, especially in the evenings.

These symptoms have seldom continued long before they are accompanied with some hoarseness, and a sense of roughness and soreness in the trachea, with some difficulty of breathing, expressed by a sense of straitness in the chest, and with a cough which seems to arise from some irritation felt at the glottis. This cough is generally at first dry and painful, occasioning pains about the chest, and more especially in the breast; sometimes, together with these symptoms, pains resembling those of the rheumatism are felt in several parts of the body, particularly about the neck and head. With all these symptoms, the appetite is impaired, some thirst arises, and a feverish lassitude is felt all over the body. These symptoms mark the height and violence of the disease; but commonly it does not continue long. By degrees the cough comes to be attended with a more copious excretion of mucus; which is at first thin, but gradually becoming thicker, is brought up with less frequent and less laborious coughing. The hoarseness and soreness of the trachea are also relieved or removed; and the febrile symptoms abating, the expectoration becomes again less, and the cough less frequent, till at length they cease altogether.

Such is generally the course of this disease, neither

tedious

tedious nor dangerous; but it is sometimes in both respects otherwise. The body affected with catarrh seems to be more than usually liable to be affected by cold air; and upon exposure of the body to fresh cold, the disease, which seemed to be yielding, is often brought back with greater violence than before, and is rendered not only more tedious than otherwise it would be, but also more dangerous by the supervening of other diseases. Some degree of the cynanche tonsillaris often accompanies the catarrh; and when this is aggravated by a fresh application of cold, the cynanche also becomes more violent and dangerous from the cough, which is present at the same time. When a catarrh has been occasioned by a violent cause, when it has been aggravated by improper management, and especially when it has been rendered more violent by fresh and repeated applications of cold, it often passes into a pneumonic inflammation, attended with the utmost danger.

Unless, however, such accidents as those happen, a catarrh, in sound persons not far advanced in life, is always a slight and safe disease: but, in persons of a phthisical disposition, a catarrh may readily produce a hemoptysis, or perhaps form tubercles in the lungs; and still more readily in persons who have tubercles already formed in the lungs, an accidental catarrh may occasion the inflammation of these tubercles, and in consequence produce a phthisis pulmonalis.

In elderly persons, a catarrh sometimes proves a dangerous disease. Many persons, as they advance in life, and especially after they have arrived at old age, have the natural mucus of the lungs poured out in greater quantity, and requiring a frequent expectoration. If, therefore, a catarrh happen to such persons, and increase the afflux of fluids to the lungs, with some degree of inflammation, it may produce the peripneumonia notha, or more properly chronic catarrh, a disease continuing often for many years, or at least regularly every winter; which in such cases is very often fatal.

Causes, &c. The proximate cause of catarrh seems to be an increased afflux of fluids to the mucous membrane of the nose, fauces, and bronchiæ, along with some degree of inflammation affecting the same. The latter circumstance is confirmed by this, that, in the case of catarrh, the blood drawn from a vein commonly exhibits the same inflammatory crust which appears in the case of phlegmasiæ. The remote cause of catarrh is most commonly cold applied to the body. This application of cold producing catarrh is generally evident and observed; and Dr Cullen is of opinion that it would always be so, were men acquainted with and attentive to the circumstances which determine cold to act upon the body.

The application of cold which occasions a catarrh, probably operates by stopping the perspiration usually made by the skin, and which is therefore determined to the mucous membrane of the parts above-mentioned. As a part of the weight which the body daily loses by insensible evacuation, is owing to an exhalation from the lungs, there is probably a connection between this exhalation and the cutaneous perspiration, so that the one may be increased according as the other is diminished; and therefore we may understand how the diminution of cutaneous perspiration, by the application of cold, may increase the afflux of fluids to the lungs, and thereby produce a catarrh.

Dr Cullen observes that there are some observations of Dr James Keil which may render this matter doubtful; but says there is a fallacy in those observations. The evident effects of cold in producing coryza, leave the matter, in general, without doubt; and there are several other observations which show a connection between the lungs and the surface of the body.

Whether from the suppression of perspiration, a catarrh be produced merely by an increased afflux of fluids, or whether in addition to this the matter of perspiration be at the same time determined to the mucous glands, and there excites a particular irritation, may be uncertain; but Dr Cullen thinks the latter supposition is most probable.

Although in the case of a common catarrh, which is in many instances sporadic, it may be doubtful whether any morbific matter be applied to the mucous glands; we are, however, certain that the symptoms of a catarrh do frequently depend upon such a matter being applied to these glands, as appears from the case of measles, chincough, and especially from the frequent occurrence of contagious and epidemical catarrh.

The phenomena of contagious catarrhs have been much the same with those of the others; and the disease has always been particularly remarkable for this, that it has been the most widely and generally spreading epidemic known. It has seldom appeared in any one country of Europe, without appearing successively in almost every different part of it; and, in some instances, it has been also transferred to America, and has been spread there in like manner, so far as we have had opportunities of being informed.

The catarrh from contagion appears with nearly the same symytoms as those above-mentioned. It seems often to come on in consequence of the application of cold. And indeed catarrh from cold and contagion are in every respect so similar, that when this epidemic rages, it is impossible to determine with a person having symptoms of catarrh after exposure to cold, whether the disease proceeds from the one cause or the other. In most instances, however, catarrh from contagion comes on with more cold shivering than the catarrh arising from cold alone; and the former does also not only sooner show febrile symptoms, but to a more considerable degree. Accordingly, it more speedily runs its course, which is commonly finished in a few days. It sometimes ends by a spontaneous sweat; and this, in some persons, produces a miliary eruption. It is, however, the febrile state of this disease especially that is finished in a few days; for the cough and other catarrhal symptoms do frequently continue longer, and often when they appear to be going off they are renewed by any fresh application of cold.

Prognosis. Considering the number of persons who are affected with catarrh, of either the one species or the other, and escape from it quickly without any hurt, it may be allowed to be a disease commonly free from danger; but it is not always to be treated as such, for

Profluvia. for in some persons it is accompanied with pneumonic inflammation. In the phthisically disposed, it often accelerates the coming on of phthisis; and in elderly persons it often proves fatal in the manner we have explained above, viz. by degenerating into its chronic state. But though chronic catarrh be often the termination of that species which arises from cold, we have not, in any case, observed it to arise as a consequence of a catarrh from contagion. This species of catarrh, however, is not unfrequently followed by phthisis; or rather where a phthisical tendency before existed, the affection has been begun and its progress accelerated from this cause.

Cure. The cure of catarrh is nearly the same, whether it proceeds from cold or contagion; only in the latter case remedies are commonly more necessary than in the former. In the cases of a moderate disease, it is commonly sufficient to avoid cold, or to abstain from animal-food for some days. In some cases, where the febrile symptoms are considerable, it is proper for that length of time to lie a-bed, and, by taking frequently some mild and diluent drink, a little warmed, to promote a very gentle sweat; and after this to take care to return very gradually only to the use of the free air. When the disease is more violent, not only the antiphlogistic regimen, exactly observed, but various remedies also, become necessary. To take off the phlogistic diathesis which always attends this disease, blood-letting, more or less, according as the symptoms shall require, is the proper remedy. After blood-letting, for restoring the determination of the fluids to the surface of the body, and at the same time for expediting the secretion of mucus in the lungs, which may take off the inflammation of its membrane, vomiting is the most effectual means. For the last-mentioned purpose, it has been supposed that squills, gum-ammoniac, the volatile alkali, and some other medicines, might be useful; but their efficacy has never been found considerable: and if squills have ever been very useful, it seems to have been rather by their emetic than by their expectorant powers. When the inflammatory affections of the lungs seem to be considerable, it is proper, besides blood-letting, to apply blisters to the back or sides.

As a cough is often the most troublesome circumstance of this disease, so demulcents may be employed to alleviate it. But after the inflammatory symptoms are much abated, if the cough still remains, opiates afford the most effectual means of relieving it; and, in the circumstances just now mentioned, they may be very safely employed. Very considerable advantage is often derived from employing opiates in such a manner as to act more immediately on the head of the wind-pipe. For this purpose, opium may often be advantageously conjoined with demulcents, melting slowly in the mouth. And perhaps no form is more convenient, or answers the purpose better, than the *trochisci glycyrrhizæ cum opio* of the Edinburgh Pharmacopœia, where purified opium is combined with extract of liquorice, gum Arabic, and other demulcents, to the extent of about a grain in a dram of the composition. After the inflammatory and febrile states of this disease are very much gone, the most effectual means of discussing all remains of the catarrhal affection is by some exercise of gestation diligently employed. Catarrhus.

Besides the remedies above-mentioned, Dr Mudge, in a treatise on this disease, recommends the steam of warm water as a most efficacious and safe remedy for a catarrh, and which indeed he seems to consider as little less than *infallible*. The method of breathing in these steams is described under the word INHALER; but he gives a caution to people in health, who may accidentally see his machine, not to make the experiment of breathing through cold water with it, or they will be almost certain of catching a severe cold. His directions for those troubled with the catarrh are as follow:

"In the evening, a little before bed-time, the patient, if of adult age, is to take three drachms, or as many tea-spoonfuls, of elixir paregoricum, in a glass of water: if the subject be younger, for instance under five years old, one tea-spoonful; or within that and ten years, two. About three quarters of an hour after, the patient should go to bed, and, being covered warm, the inhaler three parts filled with water nearly boiling (which, from the coldness of the metal, and the time it ordinarily takes before it is to be used by the patient, will be of a proper degree of warmth), and being wrapped up in a napkin, but so that the valve in the cover is not obstructed by it, is to be placed at the arm-pit, and the bed-clothes being drawn up and over it close to the throat, the tube is to be applied to the mouth, and the patient should inspire and expire through it for about twenty minutes or half an hour.

"It is very evident, as the whole act of respiration is performed through the machine, that in inspiration the lungs will be filled with air which will be hot, and loaded with vapour, by passing through the body of water; and in exspiration, all that was contained in the lungs will, by mixing with the steam on the surface of the water, be forced thro' the valve in the cover, and settle on the surface of the body under the bed-cloaths.

"The great use of this particular construction of the inhaler is this. First, as there is no necessity, at the end of every inspiration, to remove the tube from the mouth, in order to exspire from the lungs the vapour which had been received into them, this machine may therefore be used with as much ease by children as older people. And, secondly, as a feverish habit frequently accompanies the disorder, the valve in that respect also is of the utmost importance: for a sweat, or at least a free perspiration, not only relieves the patient from the restless anxiety of a hot, dry, and sometimes parched skin, but is also, of all evacuations, the most eligible for removing the fever; and it will be generally found, that, after the inhaler so constructed has been used a few minutes, the warm vapour under the cloaths will, by settling upon the trunk, produce a sweat, which will gradually extend itself to the legs and feet.

"In a catarrhous fever, or any feverish habit attending this cough, it would be proper to take a draught of warm thin whey a few minutes before the inhaler be used; and after the process is over, the sweat which it has produced may be continued by occasional

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ſmall draughts of weak warm whey or barley-water. The ſweating is by no means ſo neceſſary to the cure of the catarrhous cough, as that the ſucceſs of the inhaler againſt that complaint at all depends upon it; yet I cannot help once more remarking, that when this diſorder happens to be accompanied with a feveriſh habit, the advantages of this particular conſtruction will be very important.

" After this reſpiratory proceſs is over, the patient uſually paſſes the night without the leaſt interruption from the cough, and feels no farther moleſtation from it than once or twice in the morning to throw off the trifling leakage which, unperceived, had dripped into the bronchiæ and veſicles during the night; the thinner parts of which being evaporated, what remains is ſoon got rid of with a very gentle effort.

" I cannot, however, take leave of this part of my ſubject, without pointedly obſerving, that if the patient means not to be diſappointed by my aſſurances or his own expectations, it is eſſentially neceſſary that the following remarks, with regard to the time and manner of uſing this proceſs, ſhould be ſtrictly attended to.

" Firſt, That as tender valetudinary people are but too well acquainted with the firſt notices of the diſorder, the remedy muſt, or ought to be, uſed the ſame evening; which will, in an ordinary ſeizure, be attended with an immediate cure: but if the ſoreneſs of the reſpiratory organs, or the petulance of the cough, ſhow the cold which has been contracted to have been very ſevere, the inhaler, without the opiate, ſhould be again repeated for the ſame time the next morning.

" Secondly, if the uſe of the inhaler, &c. be delayed till the ſecond night, it will be always right to repeat it again the next morning without the opiate, but with it if the ſeizure has been violent.

" And, laſtly, if the cough be of ſome days ſtanding, it will be always neceſſary to employ both parts of the proceſs at night and the ſucceeding morning, as the firſt ſimple inflammatory miſchief is now moſt probably aggravated by an additional one of a chronic tendency.

" But if, through the want of a timely application, or a total neglect of this or any other remedy, the cough ſhould continue to haraſs the patient, it is, particularly in delicate and tender conſtitutions, of the utmoſt conſequence to attempt the removal of it as ſoon as poſſible, before any floating acrimony in the conſtitution (from the perpetual irritation) receives an habitual determination to an organ ſo eſſential to life as the lungs.

" If the patient expectorate with eaſe and freedom a thick and well-digeſted inoffenſive phlegm, there is generally but little doubt of his ſpitting off the diſorder, with common care, in a few days; and till that be accompliſhed, a proper doſe of elixir paregoricum for a few ſucceſſive nights will be found very uſeful in ſuppreſſing the fatiguing irritation and ineffectual cough, occaſioned by a matter which, dripping in the early ſtate of the diſeaſe into the bronchiæ during the night, is commonly at that time too thin to be diſcharged by thoſe convulſive efforts.

" If, however, notwithſtanding a free and copious expectoration, the cough ſhould ſtill continue, and the diſcharge, inſtead of removing the complaint, ſhould itſelf, by becoming a diſeaſe, be a greater expence than the conſtitution can well ſupport, it is poſſible that a tender patient may ſpit off his life through a weak, relaxed pair of lungs, without the leaſt appearance of purulence, or any ſuſpicion of ſuppuration. In thoſe circumſtances, beſides, as was mentioned before, increaſing the general perſpiration by the ſalutary friction of a flannel waiſtcoat, change of ſituation, and more eſpecially long journeys on horſeback, conducted as much as poſſible through a thin, ſharp, dry air, will ſeldom fail of removing the complaint.

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" But, on the contrary, if the cough ſhould, at the ſame time that it is petulant and fatiguing to the breaſt, continue dry, huſky, and without expectoration; provided there be reaſon to hope that no tubercles are forming, or yet actually formed, there is not perhaps a more efficacious remedy for it than half a drachm of gum ammoniacum, with 18 or 20 drops of liquid laudanum, made into pills, and taken at bedtime, and occaſionally repeated. This excellent remedy Sir John Pringle did me the honour to communicate to me; and I have accordingly found it, in a great many inſtances, amazingly ſucceſsful, and generally very expeditiouſly ſo; for it ſeldom fails to produce an expectoration, and to abate the diſtreſſing fatigue of the cough. In thoſe circumſtances I have likewiſe found the common remedy of ʒſs or ℈ij of *balſ. ſulph. aniſat.* taken twice a-day, in a little powdered ſugar or any other vehicle, a very efficacious one. I have alſo, many times, known a ſalutary revulſion made from the lungs by the ſimple application of a large plaſter, about five or ſix inches diameter, of Burgundy pitch between the ſhoulders; for the perſpirable matter, which is locked up under it, becomes ſo ſharp and acrid, that in a few days it ſeldoms fails to produce a very conſiderable itching, ſome little tendency to inflammation, and very frequently a great number of boils. This application ſhould be continued (the plaſter being occaſionally changed), for three weeks or a month, or longer, if the complaint be not ſo ſoon removed.

" And here I cannot help obſerving, that, though ſeemingly a trifling, it is however by no means a uſeleſs caution to the tender patient, not to expoſe his ſhoulders in bed, and during the night, to the cold; but when he lies down to take care they be kept warm, by drawing the bed-cloaths up cloſe to his back and neck.

" If, however, notwithſtanding theſe and other means, the cough, continuing dry or unattended with a proper expectoration, ſhould perſevere in haraſſing the patient; if, at laſt, it ſhould produce, together with a ſoreneſs, ſhooting pains through the breaſt and between the ſhoulders, attended alſo with ſhortneſs of the breath; and if, added to this, fluſhes of the cheeks after meals, ſcalding in the hands and feet, and other ſymptoms of a hectic, ſhould accompany the diſorder; there is certainly no time to be loſt, as there is the greateſt reaſon to apprehend that ſome acrimony in the habit is determined to the tender ſubſtance of the lungs, and that conſequently tubercular ſuppurations will follow. In this critical and dangerous ſituation, I think I can venture to ſay from long experience, that, accompanied with change of air and occaſional bleedings, the patient will find his greateſt ſecurity

Profluvia curity in a drain from a large fcapulary iffue, affifted by a diet of affes milk and vegetables."

Genus XLI. DYSENTERIA.

254 The Dysentery.

Dyfenteria, *Sauv.* gen. 248. *Lin.* 191. *Vog.* 107. *Sag.* 183. *Hoffm.* III. 151. *Junck.* 76.

Defcription. The dyfentery is a difeafe in which the patient has frequent ftools, accompanied with much griping, and followed by a tenefmus. The ftools, though frequent, are generally in fmall quantity; and the matter voided is chiefly mucus, fometimes mixed with blood. At the fame time, the natural fæces feldom appear; and when they do, it is generally in a compact and hardened form, often under the form of fmall hard fubftances known by the name of *fcybalæ*. This difeafe occurs efpecially in fummer and autumn, at the fame time with autumnal intermittent and remittent fevers; and with thefe it is often complicated. It comes on fometimes with cold fhiverings, and other fymptoms of pyrexia; but more commonly the fymptoms of the topical affection appear firft. The belly is coftive, with an unufual flatulence in the bowels. Sometimes, though more rarely, fome degree of diarrhœa is the firft appearance.—In moft cafes, the difeafe begins with griping, and a frequent inclination to go to ftool. In indulging this, little is voided, but fome tenefmus attends it. By degrees the ftools become more frequent, the griping more fevere, and the tenefmus more confiderable.—With thefe fymptoms there is a lofs of appetite, and frequently ficknefs, naufea, and vomiting, alfo affecting the patient. At the fame time there is always more or lefs of pyrexia prefent. It is fometimes of the remittent kind, and obferves a tertian period.—Sometimes the pyrexia is manifeftly inflammatory, and very often of a putrid kind. Thefe febrile ftates continue to accompany the difeafe during its whole courfe, efpecially when it terminates foon in a fatal manner. In other cafes, the febrile ftate almoft entirely difappears, while the proper dyfenteric fymptoms remain for a long time after. In the courfe of the difeafe, whether for a fhorter or a longer time, the matter voided by ftool is very various. Sometimes it is merely a mucous matter, without any blood, exhibiting that difeafe which is named by fome the *morbus mucofus*, and by others the *dyfenteria alba*. For the moft part, however, the mucus difcharged is more or lefs mixed with blood. This fometimes appears only in ftreaks among the mucus; but at other times is more copious, giving a tinct to the whole; and upon fome occafions a pure and unmixed blood is voided in confiderable quantity. In other refpects, the matter voided is varioufly changed in colour and confiftence, and is commonly of a ftrong and unufually fetid odour. It is probable, that fometimes a genuine pus is voided, and frequently a putrid fanies, proceeding from gangrenous parts. There are very often mixed with the liquid matter fome films of a membranous appearance, and frequently fome fmall maffes of a feemingly febaceous matter. While the ftools voiding thefe various matters are, in many inftances, exceedingly frequent, it is feldom that natural fæces appear in them; and when they do appear, it is, as we have faid, in the form of fcybala, that is, in fomewhat hardened, feparate balls. When thefe are voided, whether by the efforts of nature or as folicited by art, they procure a remiffion of all the fymptoms, and more efpecially of the frequent ftools, griping, and tenefmus. Dyfenteria.

Accompanied with thefe circumftances, the difeafe proceeds for a longer or a fhorter time When the pyrexia attending it is of a violent inflammatory kind, and more efpecially when it is of a very putrid nature, the difeafe often terminates fatally in a very few days, with all the marks of a fupervening gangrene. When the febrile ftate is more moderate, or difappears altogether, the difeafe is often protracted for weeks, and even for months; but, even then, after a various duration, it often terminates fatally, and generally in confequence of a return and confiderable aggravation of the inflammatory and putrid ftates. In fome cafes, the difeafe ceafes fpontaneoufly; the frequency of ftools, the griping, and tenefmus, gradually diminifhing, while natural ftools return. In other cafes, the difeafe, with moderate fymptoms, continues long, and ends in a diarrhœa, fometimes accompanied with lienteric fymptoms.

Caufes, &c. The remote caufes of this difeafe have been varioufly judged of. It generally arifes in fummer or autumn, after confiderable heats have prevailed for fome time, and efpecially after very warm and at the fame time very dry ftates of the weather; and the difeafe is much more frequent in warm than in cooler climates. It happens, therefore, in the fame circumftances and feafons which confiderably affect the ftate of the bile in the human body: but the cholera is often without any dyfenteric fymptoms, and copious difcharges of bile have been found to relieve the fymptoms of dyfentery; fo that it is difficult to determine what connection the difeafe has with the ftate of the bile.

It has been obferved, that the effluvia from very putrid animal-fubftances readily affect the alimentary canal, and, upon occafion, they certainly produce a diarrhœa; but whether they ever produce a genuine dyfentery, is not certain.

The dyfentery does often manifeftly arife from the application of cold, but the difeafe is always contagious; and, by the propagation of fuch contagion, independent of cold, or other exciting caufes, it becomes epidemic in camps and other places. It is, therefore, to be doubted if the application of cold ever produces the difeafe, unlefs where the fpecific contagion has been previoufly received into the body; and, upon the whole, it is probable that a fpecific contagion is to be confidered as being always the remote caufe of this difeafe.

Whether this contagion, like many others, be of a permanent nature, and only fhows its effects in certain circumftances which render it active, or if it be occafionally produced, we cannot determine. Neither, if the latter fuppofition be received, can we fay by what means it may be generated. As little do we know any thing of its nature, confidered in itfelf; or at moft, only this, that, in common with many other contagions, it is very often fomewhat of a putrid nature, and capable of inducing a putrefcent tendency in the human body. This, however, does not at all explain the peculiar effect of inducing thofe fymptoms which properly and effentially conftitute dyfentery. Of thefe fymptoms the proximate caufe is ftill obfcure.—

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Profluvia The common opinion has been, that the disease depends upon an acrid matter thrown upon or somehow generated in the intestines, exciting their peristaltic motion, and thereby producing the frequent stools which occur in this disease. But this supposition cannot be adopted; for, in all the instances known, of acrid substances applied to the intestines, and producing frequent stools, they at the same time produce copious stools, as might be expected from acrid substances applied to any length of the intestines. This, however, is not the case in dysentery, in which the stools, however frequent, are generally in very small quantity, and such as may be supposed to proceed from the lower parts of the rectum only. With respect to the superior portions of the intestines, and particularly those of the colon, it is probable they are under a preternatural and considerable degree of constriction: for, as we have said above, the natural fæces are seldom voided; and when they are, it is in a form which gives reason to suppose they have been long retained in the cells of the colon, and consequently that the colon had been affected with a preternatural constriction. This is confirmed by almost all the dissections which have been made of the bodies of dysenteric patients; in which, when gangrene had not entirely destroyed the texture and form of the parts, large portions of the great guts have been found affected with a very considerable constriction.

The proximate cause of dysentery, or at least the chief part of the proximate cause, seems to consist in a preternatural constriction of the colon, occasioning, at the same time, those spasmodic efforts which are felt in severe gripings, and which efforts, propagated downwards to the rectum, occasion there the frequent mucous stools and tenesmus. But whether this explanation shall be admitted or not, it will still remain certain, that hardened fæces, retained in the colon, are the cause of the griping, frequent stools, and tenesmus: for the evacuation of these fæces, whether by nature or by art, gives relief from the symptoms mentioned; and it will be more fully and usefully confirmed by this, that the most immediate and successful cure of dysentery is obtained by an early and constant attention to the preventing the constriction, and the frequent stagnation of fæces in the colon.

Cure. In the early periods of this disease, the objects chiefly to be aimed at are the following: The discharge of acrid matter deposited in the alimentary canal; the counteracting the influence of this matter when it cannot be evacuated; the obviating the effects resulting from such acrid matter as can neither be evacuated nor destroyed; and, finally, the prevention of any further separation and deposition of such matter in the alimentary canal. In the more advanced periods of the disease, the principal objects are, the giving a proper defence to the intestines against irritating causes; the diminution of morbid sensibility of the intestinal canal; and the restoration of due vigour to the system in general, but to the intestines in particular.

The most eminent of our late practitioners, and of greatest experience in this disease, seem to be of opinion, that it is to be cured most effectually by purging, assiduously employed. The means may be various; but the most gentle laxatives are usually sufficient; and, as the medicine must be frequently repeated, these are the most safe, more especially as an inflammatory state so frequently accompanies the disease. Whatever laxatives produce an evacuation of natural fæces, and a consequent remission of the symptoms, will be sufficient to effectuate the cure. But if the gentle laxatives shall not produce the evacuation now mentioned, somewhat more powerful must be employed; and Dr Cullen has found nothing more proper or convenient than tartar emetic, given in small doses, and at such intervals as may determine its operation to be chiefly by stool. To the antimonialed tartar, however, employed as a purgative, the great sickness which it is apt to occasion, and the tendency which it has, notwithstanding every precaution, to operate as an emetic, are certainly objections. Another antimonial, at one time considered as an almost infallible remedy for this disease, the vitrum antimonii ceratum, is no less exceptionable, from the uncertainty and violence of its operation; and perhaps the safest and best purgatives are the different neutral salts, particularly those containing fossile alkali, such as the soda vitriolata tartarisata or phosphorata. Rhubarb, so frequently employed, is, he thinks, in several respects, amongst the most unfit purgatives; and indeed from its astringent quality, it is exceptionable at the commencement of the affection, unless it be conjoined with something to render its operation more brisk, such as mild muriated mercury, or calomel as it is commonly called. Dysenteria.

Vomiting has been held a principal remedy in this disease; and may be usefully employed in the beginning, with a view to both the state of the stomach and of the fever: but it is not necessary to repeat it often; and, unless the emetics employed operate also by stool, they are of little service. Ipecacuanha is by no means a specific; and it proves only useful when so managed as to operate chiefly by stool.

For relieving the constriction of the colon, and evacuating the retained fæces, glysters may sometimes be useful; but they are seldom so effectual as laxatives given by the mouth; and acrid glysters, if they be not effectual in evacuating the colon, may prove hurtful by stimulating the rectum too much.

The frequent and severe griping attending this disease, leads almost necessarily to the use of opiates; and they are very effectual for the purpose of relieving from the gripes: but, by occasioning an interruption of the action of the small intestines, they favour the constriction of the colon, and thereby aggravate the disease; and if, at the same time, the use of them supersede in any measure the employing purgatives, it is doing much mischief; and the neglect of purging seems to be the only thing which renders the use of opiates very necessary.

When the gripes are both frequent and severe, they may sometimes be relieved by the employment of the semicupium, or by fomentation of the abdomen continued for some time. In the same case, the pains may be relieved, and the constriction of the colon may be taken off, by blisters applied to the lower belly.

At the beginning of this disease, when the fever is any way considerable, blood-letting, in patients of tolerable

Profluvia tolerable vigour, may be proper and neceffary; and, when the pulfe is full and hard, with other fymptoms of an inflammatory difpofition, blood-letting ought to be repeated. But, as the fever attending dyfentery is often of the typhoid kind, or does, in the courfe of the difeafe, become foon of that nature, blood-letting muft be cautioufly employed.

From our account of the nature of this difeafe, it will be fufficiently obvious, that the ufe of aftringents in the beginning of it muft be very pernicious. But although aftringents may be hurtful at early periods of this affection, yet it cannot be denied, that where frequent loofe ftools remain after the febrile fymptoms have fubfided, they are often of great fervice for diminifhing morbid fenfibility, and reftoring due vigour to the inteftinal canal. Accordingly, on this ground a variety of articles have been highly celebrated in this affection; among others we may mention the quaffia, radix indica lopeziana, verbafcum, extractum catechu, and gum kino, all of which have certainly in particular cafes been employed with great advantage. And perhaps alfo, on the fame principles, we are to account for the benefit which has been fometimes derived from the nux vomica, a remedy highly extolled in cafes of dyfentery by fome of the Swedifh phyficians; but this article, it muft be allowed, often proves very powerful as an evacuant. Its effects, however, whatever its mode of operation may be, are too precarious to allow its ever being introduced into common practice; and in this country, it has, we believe, been but very rarely employed. Whether an acrid matter be the original caufe of the dyfentery, may be uncertain; but, from the indigeftion, and the ftagnation of fluids, which attend the difeafe, we may fuppofe that fome acrid matters are conftantly prefent in the ftomach and inteftines; and therefore that demulcents may be always ufefully employed. At the fame time, from the confideration that mild oily matters thrown into the inteftines in confiderable quantity always prove laxative, Dr Cullen is of opinion, that the oleaginous demulcents are the moft ufeful. Where, however, thefe are not acceptable to the patient's tafte, thofe of the mucilaginous and farinaceous kind, as the decoctum hordei, potio cretacea, &c. are often employed with advantage.

As this difeafe is fo often of an inflammatory or of a putrid nature, it is evident that the diet employed in it fhould be vegetable and acefcent. Milk, in its entire ftate, is of doubtful quality in many cafes; but even fome portion of the cream is often allowable, and whey is always proper.—In the firft ftages of the difeafe, the fweet and fubacid fruits are allowable, and even proper. It is in the more advanced ftages only that any morbid acidity feems to prevail in the ftomach, and to require fome referve in the ufe of acefcents. At the beginning of the difeafe, abforbents feem to be fuperfluous; and, by their aftringent and feptic powers, they may be hurtful; but in after periods they are often of advantage.

When this difeafe is complicated with an intermittent, and is protracted from that circumftance chiefly, it is to be treated as an intermittent, by adminiftering the Peruvian bark, which in the earlier periods of the difeafe is hardly to be admitted.

Apoplexia.

CLASS II. NEUROSES.

ORDER I. COMATA.

COMATA, *Sauv.* Clafs VI. Ord. II. *Sag.* Clafs IX. Ord. V.
Soporofi, *Lin.* Clafs VI. Ord. II.
Adynamiæ, *Vog.* Clafs VI.
Nervorum refolutiones, *Hoffm.* III. 194.
Affectus foporofi, *Hoffm.* III. 209.
Motuum vitalium defectus, *Junck.* 114.

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Apoplexia, *Sauv.* gen. 182. *Lin.* 101. *Vog.* 229. *Boerh.* 1007. *Junck.* 117. *Sag.* gen. 288. *Wepfer.* Hift. apoplecticorum.
Carus, *Sauv.* gen. 181. *Lin.* 100. *Vog.* 231. *Boerh.* 1045. *Sag.* gen. 287.
Cataphora, *Sauv.* gen. 180. *Lin.* 99. *Vog.* 232. *Boerh.* 1048. *Sag.* gen. 286.
Coma, *Vog.* 232. *Boerh.* 1048.
Hæmorrhagia cerebri, *Hoffm.* II. 240.

To this genus alfo Dr Cullen reckons the following difeafes to belong.

Catalepfis, *Sauv.* gen. 176. *Lin.* 129. *Vog.* 230. *Sag.* gen. 281. *Boerh.* 1036. *Junck.* 44.
Affectus cerebri fpafmodico-ecftaticus, *Hoffm.* III. 44.
Ecftafis, *Sauv.* gen. 177. *Vog.* 333. *Sag.* gen. 283.

The following he reckons fymptomatic.

Typhomania, *Sauv.* gen. 178. *Lin.* 97. *Vog.* 23. *Sag.* gen. 284.
Lethargus, *Sauv.* gen. 179. *Lin.* 98. *Vog.* 22. *Sag.* gen. 285.

This difeafe appears under modifications fo various, as to require fome obfervations with refpect to each.

Sp. I. The *Sanguineous* APOPLEXY. 256

Defcription. In this difeafe the patients fall fuddenly down, and are deprived of all fenfe and voluntary motion, but without convulfions. A giddinefs of the head, noife in the ears, corrufcations before the eyes, and rednefs of the face, ufually precede. The diftinguifhing fymptom of the difeafe is a deep fleep, attended with violent fnorting; if any thing be put into the mouth, it is returned through the nofe; nor can any thing be fwallowed without fhutting the noftrils; and even when this is done, the perfon is in the utmoft danger of fuffocation. Sometimes apoplectic patients will open their eyes after having taken a large dofe of an emetic; but if they fhow no fign of fenfe, there is not the leaft hope of their recovery. Sometimes the apoplexy terminates in an hemiplegia; in which cafe it comes on with a diftortion of the mouth towards the found fide, a drawing of the tongue the fame way, and ftammering of the fpeech. Diffections fometimes fhow a rupture of fome veffels of the meninges, or even veffels of the brain itfelf; though fometimes, if we may believe Dr Willis, no

Comata defect is to be obferved either in the cerebrum or cerebellum.

Caufes, &c. The general caufe of a fanguineous apoplexy is a plethoric habit of body, with a determination to the head. The difeafe therefore may be brought on by whatever violently urges on the circulation of the blood; fuch as furfeits, intoxication, violent paffions of the mind, immoderate exercife, &c. It takes place, however, for the moft part, when the venous plethora has fubfifted for a confiderable time in the fyftem. For that reafon it commonly does not attack people till paft the age of 60; and that whether the patients are corpulent and have a fhort neck, or whether they are of a lean habit of body. Till people be paft the age of childhood, apoplexy never happens.

Prognofis. This difeafe very often kills at its firft attack; and few furvive a repetition of the fit; fo that thofe who make mention of people who have furvived feveral attacks of the apoplexy, have probably miftaken the epilepfy for this difeafe. In no difeafe is the prognofis more fatal; fince thofe who feem to be recovering from a fit, are frequently and fuddenly carried off by its return, without either warning of its approach or poffibility of preventing it. The good figns are when the difeafe apparently wears off, and the patient evidently begins to recover; the bad ones are when all the fymptoms continue and increafe.

Cure. The great object to be aimed at, is to reftore the connection between the fentient and corporeal parts of the fyftem; and when interruption to this connection proceeds from compreffion in the brain by blood, this is to be attempted, in the firft place, by large and repeated bleedings; after which, the fame remedies are to be ufed as in the ferous apoplexy, aftermentioned. The body is to be kept in a fomewhat erect pofture, and the head fupported in that fituation.

257 Sp. II. The *Serous Apoplexy*.

Apoplexia pituitofa, *Sauv*. fp. 7. Apoplexia ferofa, *Preyfinger*, fp. 4. *Morg*. de caufis, &c. IV. LX.
Carus a hydrocephalo, *Sauv*. fp. 16.
Cataphora hydrocephalica, *Sauv*. fp. 6.
Cataphora fomnolenta, *Sauv*. fp. 1.
Lethargus literatorum, *Sauv*. 7. *Van Swieten* in Aphor. 1010. 2 γ and 3 α.

Defcription. In this fpecies the pulfe is weak, the face pale, and there is a diminution of the natural heat. On diffection, the ventricles of the brain are found to contain a larger quantity of fluid than they ought; the other fymptoms are the fame as in the former.

Caufes, &c. This may arife from any thing which induces a debilitated ftate of the body, fuch as depreffing paffions of the mind, much ftudy, watching, &c. It may alfo be brought on by a too plentiful ufe of diluting, acidulated drinks. It doth not, however, follow, that the extravafated ferum above mentioned in the ventricles of the brain is always the caufe of the difeafe, fince the animal-humours are very frequently obferved to ooze out in plenty through the coats of the containing veffels after death, though no extravafation took place during life.

Prognofis. This fpecies is equally fatal with the other; and what hath been faid of the prognofis of the fanguineous, may alfo be faid of that of the ferous, apoplexy. Apoplexia.

Cure. In this fpecies venefection can fcarcely be admitted: acrid purgatives, emetics, and ftimulating clyfters, are recommended to carry off the fuperabundant ferum; but in bodies already debilitated, they may perhaps be liable to the fame exceptions with venefection itfelf. Volatile falts, cephalic elixirs, and cordials, are alfo prefcribed; and in cafe of a hemiplegia fupervening, the cure is to be attempted by aperient ptifans, cathartics, and fudorifics; gentle exercife, as riding in a carriage; with blifters and fuch ftimulating medicines as are in general had recourfe to in affections originally of the paralytic kind.

Sp. III. *Hydrocephalic Apoplexy*, or *Dropfy* of the *Brain*. 258

Hydrocephalus interior, *Sauv*. fp. 1.
Hydrocephalus internus, *Whytt's* works, pag 725. London Med. Obf. vol. iv. art. 3, 6, and 25. *Gaudelius* de hydrocephalo, apud *Sandifort* Thefaur. vol. ii.
Hydrocephalus acutus, *Quin*, *Diff*. de hydrocephalo, 1779.
Afthenia a hydrocephalo, *Sauv*. fp. 3.

Hiftory and defcription. This difeafe has been accurately treated within thefe few years by feveral eminent phyficians, particularly the late Dr Whytt, Dr Fothergill, and Dr Watfon; who concur in opinion, with refpect to the feat of the complaint, the moft of its fymptoms, and its general fatality. Out of twenty patients that had fallen under Dr Whytt's obfervation, he candidly owns that he had been fo unfortunate as to cure only one who laboured under the characteriftic fymptoms of the hydrocephalus; and he fufpects that thofe who imagine they have been more fuccefsful, had miftaken another diftemper for this. It is by all fuppofed to confift in a dropfy of the ventricles of the brain; and this opinion is fully eftablifhed by diffections. It is obferved to happen more commonly to healthy, active, lively children, than to thofe of a different difpofition.

Dr Whytt fuppofes that the commencement of this difeafe is obfcure; that it is generally fome months in forming; and that, after fome obvious urgent fymptoms rendering affiftance neceffary, it continues fome weeks before its fatal termination. This, in general, differs from what has hitherto been obferved by Dr Fothergill; the latter informing us, that he has feen children, who, from all appearance, were healthy and active, feized with this diftemper, and carried off in about 14 days. He has feldom been able to trace the commencement of it above three weeks.

Though the hydrocephalus be moft incident to children, it has been fometimes obferved in adults; as appears from a cafe related by Dr Huck, and from fome others.

When the difeafe appears under its moft common form, the fymptoms at different periods are fo various as to lead Dr Whytt to divide the difeafe into three ftages, which are chiefly marked by changes occurring in the condition of the pulfe. At the beginning it is quicker

quicker than natural; afterwards it becomes uncommonly slow; and towards the conclusion of the disease it becomes again quicker than natural, but at the same time very irregular.

Those who are seized with this distemper usually complain first of a pain in some part below the head; most commonly about the nape of the neck and shoulders; often in the legs; and sometimes, but more rarely, in the arms. The pain is not uniformly acute, nor always fixed to one place; and sometimes does not affect the limbs. In the latter case, the head and stomach have been found to be most disordered; so that when the pain occupied the limbs, the sickness or head-ach was less considerable; and when the head became the seat of the complaint, the pain in the limbs was seldom or never mentioned. Some had very violent sicknesses and violent head-achs alternately. From being perfectly well and sportive, some were in a few hours seized with those pains in the limbs, or with sickness, or head-ach, in a slight degree, commonly after dinner; but some were observed to droop a few days before they complained of any local indisposition. In this manner they continued three, four, or five days, more or less, as the children were healthy and vigorous. They then commonly complain of an acute deep-seated pain in the head, extending across the forehead from temple to temple; of which, and a sickness, they alternately complain in short and affecting exclamations; dosing a little in the intervals, breathing irregularly, and sighing much while awake. Sometimes their sighs, for the space of a few minutes, are incessant.

As the disease advances, the pulse becomes slower and irregular, the strokes being made both with unequal force and in unequal times, till within a day or two of the fatal termination of the disorder, when it becomes exceeding quick; the breathing being at the same time deep, irregular, and laborious. After the first access, which is often attended with feverish heats, especially towards evening, the heat of the body is for the most part temperate, till at last it keeps pace with the increasing quickness of the pulse. The head and præcordia are always hot from the first attack. The sleeps are short and disturbed, sometimes interrupted by watchfulness; besides which there are startings.

In the first stage of the disease there seems to be a peculiar sensibility of the eyes, as appears from the intolerance of light. But in the progress of the disease a very opposite state occurs: The pupil is remarkably dilated, and cannot be made to contract by the action even of strong light; such, for example, as by bringing a candle very near to it. In many cases there is reason to believe that total blindness occurs: Often also the pupil of one eye is more dilated than that of another, and the power of moving the eyes is also morbidly affected. Those children, who were never observed to squint before, often become affected with a very great degree of strabismus. The patients are unwilling to be disturbed for any purpose, and can bear no posture but that of lying horizontally. One or both hands are most commonly about their heads. The urine and stools come away insensibly. At length the eyelids become paralytic, great heat accompanied with sweat overspreads the whole body, respiration is rendered totally suspirious, the pulse increases in its trembling undulations beyond the possibility of counting, till the vital motions entirely cease; and sometimes convulsions conclude the scene.

Many of the symptoms above enumerated are so common to worm-cases, teething, and other irritating causes, that it is difficult to fix upon any which particularly characterise this disease. The most peculiar seem to be the pains in the limbs, with sickness and incessant head-ach; which, though frequent in other diseases of children, are neither so uniformly nor so constantly attendant as in this. Another circumstance observed to be familiar, if not peculiar to this distemper, is, that the patients are not only costive, but it is likewise with the greatest difficulty that stools can be procured. These are generally of a very dark greenish colour with an oiliness or a glassy bile, rather than the slime which accompanies worms; and they are, for the most part, extremely offensive. No positive conclusion can be drawn from the appearance of the urine; it being various, in different subjects, both in its colour and contents, according to the quantity of liquor they drink, and the time between the discharges of the urine. From their unwillingness to be moved, they often retain their water 12 or 15 hours, and sometimes longer. In complaints arising from worms, and in dentition, convulsions are more frequent than in this disorder. Children subject to fits are sometimes seized with them a few days before they die. Sometimes these continue 24 hours incessantly, and till they expire.

Causes. The causes of internal hydrocephalus are very much unknown. Some suppose it to proceed from a rupture of some of the lymphatic vessels of the brain. But this supposition is so far from being confirmed by any anatomical observation, that even the existence of such vessels in the brain is not clearly demonstrated. That lymphatics, however, do exist in the brain, cannot be doubted; and one of the most probable causes giving rise to an accumulation of water in the brain is a diminished action of these. Here, however, as well as in other places, accumulation may also be the consequence of augmented effusion; and in this way, an inflammatory disposition, as some have supposed, may give rise to the affection. But from whatever cause an accumulation of water in the ventricles of the brain may be produced, there can be no doubt that from this the principal symptoms of the disease arise, and that a cure is to be accomplished only by the removal of it. It is, however, probable, that the symptoms are somewhat varied by the position of the water, and that the affection of vision in particular is often the consequence of some morbid state about the *thalami nervorum opticorum*; at least, in many cases, large collections of water in the ventricles have occurred, without either strabismus, intolerance of light, or dilatation of the pupil. And in cases where these symptoms have taken place to a remarkable degree, while upon dissection after death but a very small collection of water was found in the ventricles, it has been observed that a peculiar tumid appearance was discovered about the optic nerves, which upon examination was found to arise from water in the cellular texture. This may have given compression producing a state of insensibility; but it may have been preceded, or it may even have originated from, some inflammatory af-

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fection of these parts, producing the intolerance of light.

Prognosis and Cure. Till very lately this disorder was reckoned totally incurable; but of late it has been alleged, that mercury, if applied in time, will remove every symptom. This remedy was first thought of by Dr Dobson of Liverpool, and afterwards employed apparently with success by Dr Percival and others. The method of exhibiting this medicine in order to effect a cure, as well as the inutility of other medicines, will fully appear from the following cases.

Case I. By Dr Percival.

" September 4. 1777. Master H. a child at the breast, aged seven months, has laboured about a fortnight under a slow irregular fever. His eyes have been now and then a little distorted; he has been affected with some degree of stupor: his gums have been inflamed and tender; and his mouth uncommonly dry. No tooth has yet made its appearance. An emetic has been administered; a blister applied to his back; and his belly has been kept soluble by repeated small doses of magnesia. During the action of the blister, he was thought to be much better, but he soon relapsed into his former state.

" About three o'clock this morning he was convulsed: at nine I saw him; and from his countenance instantly suspected a dropsy of the brain. The symptoms confirmed my apprehensions. His skin was hot; yet his pulse beat only 78 strokes in a minute, which were irregular. The pupils of his eyes were considerably, but unequally, dilated; nor did they contract much when a lighted candle was suddenly held before them. He often squinted, especially with the right eye, and seemed to take no notice of any objects around him. He refused the breast, and seldom swallowed till the lips and tongue had been stimulated with a feather. During several days past, he had been frequently observed to rub the end of his nose when his hand was at liberty; and, notwithstanding his stupor, he had been uncommonly watchful. I examined his head, and found a manifest tumor of the bregma, which had never before been noticed. Convinced by all these circumstances that the child laboured under the hydrocephalus internus, and that he was now in the second stage of that disorder, I directed ten grains of the *unguentum mercuriale mitius* to be rubbed into his thighs every three hours, till the mouth should be affected, and a tea-spoonful of the following mixture to be given whenever the convulsive symptoms recurred.

R. *Salis ammon. vol.* ℈i. *Succi Lemon.* ʒvi. *Mosch. opt. mucilagine gum. Arabic. solut.* gr. vi. *Sacch. alb.* q. s. *ad gratiam. M.*

" Small blisters were applied on each side of the head, just below the bregma; and a folded rag, frequently moistened with brandy, was laid upon the tumor to promote absorption. An emetic had been given early in the morning, by which a large quantity of bile was discharged; and a vesicatory had also been applied to his leg.

" September 5. nine o'clock. The child has had frequent convulsions in the night; his right eye is much distorted; and it has been remarked, that he seldom moves the right hand. The pulse beat 1?0 strokes in a minute. Two scruples of the mercurial ointment have been used, and he has taken five grains of musk. A large discharge of serum has been produced by the blisters. Five o'clock, P. M. the tumor of the head is sensibly diminished; the child's mouth is now moist, and often filled with saliva; and his tongue appears to be swolen. His pulse beat 146 strokes in a minute. I directed another blister to be applied to the head.

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" September 6. His convulsions have been much slighter; his eyes are frequently distorted; and the pupils of each are more contracted. The stupor is considerably abated; the child seems to take some notice, distinguishes taste, and swallows freely. The musk has been continued; and half a dram more of the mercurial ointment has been consumed. A clyster was injected last night, but ineffectually: I therefore prescribed a grain of jalap, mixed with an equal quantity of sugar, to be given every three hours, till a motion to stool succeeded.

" September 7. The child has passed the night more comfortably, but not free from convulsions. His head has sweated profusely, and the blisters have run much. The tumor of the bregma is considerably reduced. The jalap operated gently last night, and the mercurial unction has been twice repeated. There is an evident mitigation of all the symptoms

" September 8. About eleven o'clock last night, the child was attacked with severe convulsions, which recurred frequently till six o'clock this morning. He has had a short sleep, and is now composed. His pulse beats 140 strokes in a minute; his heat is moderate; and his skin soft and perspirable. The mercurial ointment has been again used; but, though his gums and tongue are sore and very moist, his breath is not offensive. I directed a grain of calomel to be immediately given, to procure a stool; and a blister to be applied to the occiput.

" September 10. He has passed two nights almost entirely free from convulsions Ten grains of the mercurial ointment have been again rubbed into his thighs. The dose of calomel occasioned three very offensive stools; and directions are given to repeat it, as he is again costive. The blister applied to the occiput, like the others, has produced a very copious discharge. The tumor of the head is now scarcely perceptible. Pulse 120.

" September 12. At 12 o'clock last night, the convulsions recurred with greater violence than ever, and still continue. Two teeth have almost protruded through the upper, and the same number through the lower gum. Pulse 160, tremulous, and irregular. I directed that the child should be immediately put into a warm bath, and that the following remedies should be administered.

R. *Infus. rad. valer. fortissimi* ℥ii.
Asafœtid. electæ ℈ß. M. f. *Enema statim injiciendum.*

R. *Tinct. valer. volat.* ʒii. *Dentur guttæ* jii. *Subinde e cochleari parvulo infusi rad. valer. sylv. sub forma theæ parati.*

" The convulsions continued, but with less violence; and the child expired about one o'clock in the afternoon."

On this case the Doctor makes the following observations.

" The deplorable case which I have related appears

Comata pears to have originated from the irregular action produced in the syſtem by dentition, and from the want of a due ſecretion of ſaliva in the mouth, by which the fluid diſcharges were probably increaſed in the ventricles of the brain. That theſe diſcharges were diminiſhed, and that the extravaſated water was abſorbed, by the powerful action of the mercury, may be preſumed from the mitigation of all the ſymptoms which ſucceeded the ſalivation. And I am inclined to believe, that the convulſions under which the child expired were more owing to the irritation of his gums by the protruſion of four teeth, than to any remaining water in the brain; for the tumor of the head had entirely diſappeared, and after death there was a manifeſt depreſſion of the bregma. During the ſpace of a week, 110 grains of the unguentum mercuriale mitius, which contains about 22 grains of mercury, was conſumed in the uſual way of friction. Perhaps half of this quantity might be abſorbed, and carried into the courſe of circulation; to which may be added, part of the two grains of the calomel adminiſtered internally. The ſymptoms of the ſalivation were not violent; and the effects of the mercury did not appear formidable or alarming, even to the parents of the child, who were appriſed of the nature of the diſorder, and fully approved of the trial of this new method of treating it."

Case II. By Dr Dobson.

"On the 13th of February 1775, I was called to the only ſon of Mr C. a gentleman of this place: the child was between three and four years of age; had been indiſpoſed about eight days; and had frequently complained of pain in his head and wearineſs, and pains in his limbs: had been ſick by fits, and ſometimes vomited; was feveriſh, and could not bear the light.

"I was much alarmed on hearing this account, as the *hydrocephalus internus* had already proved fatal to three children of this family, who had all been under my care. And that this had been the diſeaſe was evident, both from the ſymptoms and the appearances on diſſection. But my alarm was much farther increaſed on examining the little patient. The pulſe I found very frequent and irregular. The head hot, the cheeks fluſhed, the pupils dilated, and a great degree of ſtrabiſmus. There remained no doubt with reſpect to the nature of the diſeaſe.

"An emetic, ſome calomel powders, and a purgative, had been adminiſtered, without affording any relief. I directed the pediluvium, and emetic tartar, to be given in ſuch doſes as to excite nauſea.

"February 14th. The ſymptoms the ſame, with frequent ſtartings, diſturbed ſleep, and toſſing from ſide to ſide on the pillow. A bliſter was applied between the ſhoulders, the pediluvium repeated, and the emetic tartar continued.

"15th. Comatoſe, reſtleſs, and ſhrieking by fits. The pulſe ſlower than in health, and the eyes inſenſible even to the impreſſions of ſtrong light.

"As I had no hope of doing any thing effectual for the recovery of my patient, I paid my viſits, preſcribed, and gave directions with a foreboding and heavy heart. Anxiouſly, however, conſidering the caſe in different points of view, and fully convinced that it Apoplexia. was vain to purſue the uſual line of practice, it occurred to me, that mercurials, ſo far urged as to enter the courſe of circulation, and affect the ſalivary glands, might poſſibly reach the ſyſtem of abſorbents in the ventricles of the brain, and thus remove the extravaſated fluid.

"The ſhort continuance of the diſeaſe, and the apparent ſtrength of my patient, were favourable to the trial of this method. No time, however, was to be loſt. The parents were conſulted, and readily gave their ſanction to the propoſal; for they were convinced, that, unleſs ſome powerful ſteps were taken, this their only ſon muſt be numbered with thoſe of their children who had already fallen a ſacrifice to the diſeaſe.

"The mercurial courſe, therefore, was commenced, and urged on with caution and expedition. In 48 hours the breath began to be offenſive; the gums were reddiſh and ſwelled; and the ſymptoms of the diſeaſe, ſo far as could be diſtinguiſhed, were ſomewhat abated. In 48 hours more the ptyaliſm came on, and the diſeaſe was evidently declining. Between the 15th and 22d he took 20 grains of calomel, and one drachm of the ſtrongeſt mercurial ointment was likewiſe rubbed in well upon the legs and thighs. The doſe of calomel was one grain, mixed with a little ſugar, and repeated at ſuch intervals as the circumſtances of the caſe pointed out.

"After the 22d no more mercurials were adminiſtered; a moderate ptyaliſm continued for five or ſix days, then gradually ceaſed, and the diſeaſe was entirely removed. The bark was then given, as the beſt tonic remedy after the mercurial courſe, and as the beſt preſervative againſt a relapſe. The ſtrabiſmus, I obſerved, was the laſt ſymptom which diſappeared.

"From the 15th, no other medicines were uſed except mercurials. The three ſiſters of the above patient, who all died of this diſeaſe, were treated with bliſters; and to one of them they were applied in ſucceſſion to the head, behind the ears, and between the ſhoulders."

Case III. By Dr Percival.

"One of my own children, a girl, aged three years and three months, has lately been a ſevere ſufferer under this alarming malady. As ſoon as the characteriſtic ſymptoms of the diſeaſe clearly manifeſted themſelves, I laid aſide all other remedies, convinced, by repeated obſervation, of their inſufficiency; and truſted ſolely, though with much ſolicitude, to the internal and external uſe of mercury. In 48 hours, ſigns of amendment appeared, and her recovery was perfected in ſix days. During this ſpace of time, thirteen grains of calomel were adminiſtered, and ſeven ſcruples of *unguentum mercuriale fortius* carefully rubbed into her legs."

Case IV. By Mr John Mackie Surgeon in Huntington.

John Algood, aged 27, of a thin habit of body, accuſtomed for four or five years paſt to work in a tan yard in a very ſtooping poſture, was attacked in the beginning of May with an irregular intermitting fever, accompanied with much pain in his joints.

Comata

These complaints continued till about the middle of June, when he was feized with a violent and conftant pain in the back-part of his head, attended with great giddinefs, noife in his head and ears, dimnefs of fight, &c. and his fever became more continued. He lay in this ftate upwards of a month, without receiving any benefit from fome medicines which he took during this period.

Mr Mackie was called to him in the middle of July, and found him labouring under the following fymptoms: A fixed pain on the right fide and back part of his head, which was frequently fo acute as to make him quite outrageous, crying out, tearing his hair, beating himfelf on the head, &c. He had fuch a giddinefs, that, unlefs ftrongly held, he could not fupport himfelf a moment in an upright pofture. He could not bear the light; and, when he did venture to open his eyes, could not fee objects diftinctly. His pupils were uncommonly dilated; and his right eye feemed drawn outward, and rather contracted in its volume. He complained of a ftrange palpitating noife in his head and ears; and faid, he felt at times as if there was a weight of water falling from one fide of his head to the other. He was, in general, fenfible; but, on afking him two or three queftions together, he became confufed, and, like a perfon with an oppreffed brain, anfwered with hefitation, quite wide of the queftion, and often oppofite to what he meant. Along with thefe, he had a hot fkin, fmall quick pulfe, thirft, a foul tongue, urine in fmall quantity and high-coloured; he was emaciated, fick, coftive, and fweated much; had often a kind of ftupor, but very little fleep. Once in the 24 hours he had generally a remiffion (of three or four hours continuance) of the febrile fymptoms, but of none of the other complaints.

July 16th. Ordered three or four leeches to be applied to each temple immediately; an emetic to be taken in the evening, and a cooling purge to-morrow morning.

17th. In the evening found the leeches had taken away a good deal of blood, and the vomit and purge operated well. No change in the complaints, except that the ficknefs is a little abated. He fcreamed greatly on attempting to raife his head from the pillow.

Ordered his head to be fhaved, and a fharp blifter to be applied all over the occiput, large enough to cover the nape of the neck; alfo one on the infide of the leg. Internally,—R. *Nitri puri*, dr. fs. *Camphoræ*, gr. iv. M. f. *pulvis; quarta quaque hora fumendus durante febrili calore.* R. *Pulv. cort. Peruvian.* dr. i. *Pulv. rad. valerian. fylv.* dr. fs. M. f. *pulvis, exhibendus quamprimum remiffio appareat, & repetendus fi ultra horas tres pergat.* Thin milk-gruel and barley-water for drink.

July 19th. The blifters have difcharged much, and he has taken the medicines punctually; but the fever and other complaints remain as before. Pulfe very irregular; pain in the head and reftleffnefs extreme.

I left off the camphor; and in its ftead added to each nitrous powder, tartar emetic, gr. $\frac{1}{4}$ Dreffed the blifters with the *unguent. ad veficatoria.*

21ft. Two dofes of the bark and valerian were given during the two laft remiffions of the fever, which were full four hours each; but to-day there appears no kind of amendment. All the fymptoms continue much the fame. Shrieked out much, and talked incoherently. Has had no ftool fince he took his phyfic. Ordered a laxative glyfter to be thrown up directly, and the medicines to be continued as on the 19th.

Apoplexia.

23d. The glyfter procured two motions. Has fweated profufely through the laft 48 hours. Blifters have run freely. The two laft diurnal remiffions not quite fo diftinct. No abatement of the other complaints, The pain, giddinefs, ftupor, contortion of the eyes, &c. remain in as great a degree as ever.

Mr Mackie now left off all other medicines, and ordered ten grains of calomel, made into a bolus with conferve of rofes, to be taken at bed-time: at the fame time, a dram of the ftrong mercurial ointment was directed to be rubbed into the ankles; and both to be repeated every night.

25th. Found no alteration. Fever and other fymptoms the fame. Blifters heal, having been dreffed thefe two days with bafilicon. The calomel, and mercurial friction, ordered to be continued as on the 23d.

26th. Mr Mackie found him complaining much of being griped. Had two purging ftools in the laft 24 hours. His gums were a little tender, and his breath beginning to be tainted. In other refpects as ufual. Left off the calomel, and ordered a double quantity of the mercurial ointment to be rubbed into his thighs every night.

28th. He had had a calmer night than any for thefe two months paft. For the firft time, he faid the pain of his head was abated; he looked more compofed; his fkin felt cooler; his pulfe more full, and not fo quick. He complained of his mouth being fore, and his tongue fwelled; and had difcharged a good deal of faliva in the night. Only one dram of the ointment to be rubbed in, for the two next nights.

30th. He fpit about three quarts during the laft 48 hours, and complains of much heat in his mouth; but all his other complaints better. Pain in his head almoft gone, excepting now and then a fhoot. Giddinefs much abated. He faid he often felt a trickling kind of motion, as of water running along the infide of his temples; but this fenfation was without pain. He could fit up in bed, and feed himfelf; was fenfible, and in fpirits. Pulfe regular, and not above 70 in a minute. He has had a remiffion of upwards of fix hours to-day; ordered the ointment to be left off.

Aug. 1ft. Continues to fpit freely. Had yefterday a fmart return of the fever; which, however, only held him about 12 hours. To-day there is a perfect remiffion, and he is in every refpect much mended.—Has had fome hours good fleep. Complains very little of pain. Got out of bed for the firft time; fat up three hours; and could even bear the light without being difturbed by it. Complained of being hungry. Allowed plenty of milk-porridge and fmall broth.

3d. The fpitting keeps up to about a quart in the 24 hours. Found him out of bed to-day, and almoft without complaints. He faid his head was well; and that he only wanted ftrength, and to get rid of his fever and fore mouth. The remiffions were now almoft as long as the paroxyfms, being about 12 hours each. Has taken no medicine internally fince he left off the calomel, Comata calomel, and was costive. Ordered a dose of rhubarb; and after its operation a dram of the bark every four hours during the remissions.

6th The spitting begins to decline. He has had no fever for the last 24 hours. He sleeps well; and has an appetite, if the soreness of his mouth would let him eat. Headach and giddiness gone; but his pupils still continue much dilated. Ordered him another rhubarb-purge, and the bark to be continued every six hours.

9th. Has had no fever, or other complaints. Spitting inconsiderable; mouth better; aspect more natural; is able to walk about, and mends daily. Allowed him a more generous and substantial diet, and continued the bark twice a-day for another week.

From this time, he continued to get strength apace; had good nights, good appetite, a perfect freedom from headach and fever; and, on the 23d, went to work, being in every respect quite well, and has continued so ever since.

This patient did not seem to receive the smallest benefit from the blisters, or any thing else, till he took the mercury, which acted like a specific; and the fever seemed to be altogether symptomatic, as it easily yielded after the other complaints were removed.

Although it must be allowed, that the affection here described was in many respects an anomalous one, yet many of the circumstances render it in some degree probable that it depended on water in the head; and there are strong reasons for inferring that the mercury pushed so far as to excite salivation, was the means by which the cure was accomplished.

It is not wonderful that the publication of these cases should have led to the frequent employment of mercury in hydrocephalic affections. We are, however, sorry to add, that extensive employment of this remedy in such cases has by no means confirmed the favourable opinion which some were disposed to entertain of it. It has been found, that in many cases where mercury with hydrocephalic patients had been employed both internally and externally to a very great extent, no salivation was produced. Some, therefore, have even gone so far as to conclude, that salivation cannot be induced in this disease: and there is little reason to doubt, that, in the advanced periods of the disease, there occurs both an insensibility and diminished action of the absorbents, by which alone mercury can be introduced into the system; and likewise of the salivary organs, on which it must act before any obvious salivation can be induced. But, besides that mercury is often given in this disease even to a great extent without producing any obvious effect, we must also mention with regret, that in not a few cases of hydrocephalus, where mercury copiously exhibited at an early period produced salivation, the disease nevertheless has had a fatal termination; and it must be confessed, that an effectual remedy in this complaint still remains to be discovered.

At the same time, besides the cases already mentioned, mercury has also succeeded in several others which had every appearance of hydrocephalus; and as we are yet unacquainted with any remedy, not even excepting blisters, of which some are disposed to think very favourably, on which more dependence is to be put, the careful and regular employment of it should not be neglected in any instance of this affection, unless some circumstance occur strongly contraindicating its use. Apoplexia.

Sp. IV. Apoplexy *from Atrabilis.* 259

Apoplexia atrabiliaris, *Sauv.* sp. 12. *Preysinger.* sp. 6.

This takes place in the last stage of the diffusion of bile through the system, i. e. of the black jaundice, and in some cases the brain hath been found quite tinged brown. It cannot be thought to admit of any cure.

Sp. V. Apoplexy from *External Violence.* 260

Apoplexia traumatica, *Sauv.* sp. 2.
Carus traumaticus, *Sauv.* sp. 5.

The treatment of this disease, as it arises from some external injury, properly falls under the article Surgery.

Sp. VI. Apoplexy *from Poisons.* 261

Apoplexia temulenta, *Sauv.* sp. 3.
Carus a narcoticis, *Suav.* sp 14.
Lethargus a narcoticis, *Sauv* sp. 3.
Carus a plumbagine, *Sauv.* sp. 10.
Apoplexia mephitica, *Sauv.* sp. 14.
Asphyxia a mephitide, *Sauv.* sp. 9.
Asphyxia a musto, *Sauv.* sp. 3.
Catalepsis a fumo, *Sauv.* sp. 3.
Asphyxia a fumis, *Sauv.* sp. 2.
Asphyxia a carbone, *Sauv.* sp. 16.
Asphyxia foricariorum, *Sauv.* sp. 11.
Asphyxia sideratorum, *Sauv.* sp. 10.
Carus ab insolatione, *Sauv.* sp. 12.
Carus a frigore, *Sauv.* sp. 15.
Lethargus a frigore, *Sauv.* sp. 6.
Asphyxia congelatorum, *Sauv.* sp. 5.

The poisons which bring on an apoplexy when taken internally may be either of the stimulant or sedative kind, as spirituous liquors, opium, and the more virulent kinds of vegetable poisons. The vapours of mercury, or of lead, in great quantity, will sometimes produce a similar effect; though commonly they produce rather a paralysis, and operate slowly. The vapours of charcoal, or fixed air, in any form, breathed in great quantity, also produce an apoplexy, or a state very similar to it; and even cold itself produces a fatal sleep, though without the apoplectic snorting.—To enumerate all the different symptoms which affect the unhappy persons who have swallowed opium, or any of the stronger vegetable poisons, is impossible, as they are scarce to be found the same in any two patients. The state induced by them seems to differ somewhat from that of a true apoplexy; as it is commonly attended with convulsions, but has the particular distinguishing sign of apoplexy, namely, a very difficult breathing or snorting, more or less violent according to the quantity of poisonous matter swallowed.

Of the poisonous effects of fixed air, Dr Percival gives the following account. "All these noxious vapours, whether arising from burning charcoal, the fermenting grape, the Grotti di Cani, or the cavern of Pyrmont, operate nearly in the same manner. When accumulated and confined, their effects are often instantaneous:

Comata ſtantaneous: they immediately deſtroy the action of the brain and nerves, and in a moment arreſt the vital motions. When more diffuſed, their effects are ſlower, but ſtill evidently mark out a direct affection of the nervous ſyſtem.

"Thoſe who are expoſed to the vapours of the fermenting grape, are as inſtantly deſtroyed as they would be by the ſtrongeſt electrical ſhock. A ſtate of inſenſibility is the immediate effect upon thoſe animals which are thruſt into the Grotti di Cani, or the cavern of Pyrmont: the animal is deprived of motion, lies as if dead; and if not quickly returned into the freſh air, is irrecoverable. And if we attend to the hiſtories of thoſe who have ſuffered from the vapours of burning charcoal, we ſhall in like manner find, that the brain and moving powers are the parts primarily affected.

"A cook who had been accuſtomed to make uſe of lighted charcoal more than his buſineſs required, and to ſtand with his head over theſe fires, complained for a year of very acute pain in the head; and after this, was ſeized with a paralytic affection of the lower limbs, and a ſlow fever.

"A perſon was left reading in bed with a pan of charcoal in a corner of the room. On being viſited early the next morning, he was found with his eyes ſhut, his book open and laid on one ſide, his candle extinguiſhed, and to appearance like one in a deep ſleep. Stimulants and cupping-glaſſes gave no relief; but he was ſoon recovered by the free acceſs of freſh air.

"Four priſoners, in order to make their eſcape, attempted to deſtroy the iron work of their windows, by the means of burning charcoal. As ſoon as they commenced their operations, the fumes of the charcoal being confined by the cloſeneſs of the priſon, one of them was ſtruck dead; another was found pale, ſpeechleſs, and without motion; afterwards he ſpoke incoherently, was ſeized with a fever, and died. The other two were with great difficulty recovered.

"Two boys went to warm themſelves in a ſtove heated with charcoal. In the morning they were found deſtitute of ſenſe and motion, with countenances as compoſed as in a placid ſleep. There were ſome remains of pulſe; but they died in a ſhort time.

"A fiſherman depoſited a large quantity of charcoal in a deep cellar. Some time afterwards, his ſon, a healthy ſtrong man, went down into the cellar with a pan of burning charcoal and a light in his hand He had ſcarcely deſcended to the bottom, when his candle went out. He returned, lighted his candle, and again deſcended. Soon after, he called aloud for aſſiſtance. His mother, brother, and a ſervant, haſted to give him relief; but none of them returned. Two others of the village ſhared the ſame fate. It was then determined to throw large quantities of water into the cellar; and after two or three days, they had acceſs to the dead bodies.

"Cœlius Aurelianus ſays, that thoſe who are injured by the fumes of charcoal become cataleptic. And Hoffman enumerates a train of ſymptoms which in no reſpect correſpond with his idea of ſuffocation. Thoſe who ſuffer from the fumes of burning charcoal, ſays he, have ſevere pains in the head, great debility, faintneſs, ſtupor, and lethargy.

"It appears from the above hiſtories and obſervations, that theſe vapours exert their noxious effects on the brain and nerves. Sometimes they occaſion ſudden death; at other times, the various ſymptoms of a debilitated nervous ſyſtem, according as the poiſon is more or leſs concentrated. The olfactory nerves are firſt and principally affected, and the brain and nervous ſyſtem by ſympathy or conſent of parts. It is well known, that there is a ſtrong and ready conſent between the olfactory nerves and many other parts of the nervous ſyſtem. The effluvia of flowers and perfumes, in delicate or irritable habits, produce a train of ſymptoms, which, though tranſient, are analogous to thoſe which are produced by the vapours of charcoal; viz. vertigo, ſickneſs, faintneſs, and ſometimes a total inſenſibility. The female malefactor, whom Dr Mead inoculated by putting into the noſtrils doſſils of cotton impregnated with variolous matter, was, immediately on the introduction, afflicted with a moſt excruciating headach, and had a conſtant fever till after the eruption.

Apoplexia.

"The vapours of burning charcoal, and other poiſonous effluvia, frequently produce their prejudicial, and even fatal effects, without being either offenſive to the ſmell or oppreſſive to the lungs. It is a matter of importance, therefore, that the common opinion ſhould be more agreeable to truth; for where ſuffocation is ſuppoſed to be the effect, there will be little apprehenſion of danger, ſo long as the breaſt keeps free from pain or oppreſſion.

"It may be well to remember, that the poiſon itſelf is diſtinct from that groſs matter which is offenſive to the ſmell; and that this is frequently in its moſt active ſtate when undiſtinguiſhed by the ſenſe. Were the following cautions generally attended to, they might in ſome inſtances be the happy means of preſerving life. Never to be confined with burning charcoal in a ſmall room, or where there is not a free draught of air by a chimney or ſome other way. Never to venture into any place in which air has been long pent up, or which from other circumſtances ought to be ſuſpected; unleſs ſuch ſuſpected place be either previouſly well ventilated, or put to the teſt of the lighted candle. For it is a ſingular and well-known fact, that the life of flame is in ſome circumſtances ſooner affected and more expeditiouſly extinguiſhed by noxious vapours than animal-life. A proof of which I remember to have received from a very intelligent clergyman, who was preſent at a muſical entertainment in the theatre at Oxford. The theatre was crowded; and during the entertainment, the candles were obſerved to burn dim, and ſome of them went out. The audience complained only of faintneſs and langour; but had the animal effluvia been ſtill further accumulated or longer confined, they would have been extinguiſhed as well as the candles.

"The moſt obvious, effectual, and expeditious means of relief to thoſe who have unhappily ſuffered from this cauſe, are ſuch as will diſlodge and waſh away the poiſon, reſtore the energy of the brain and nerves, and renew the vital motions. Let the patient therefore be immediately carried into the open air, and let the air be fanned backwards and forwards to aſſiſt its action: let cold water be thrown on the face; let the face, mouth, and noſtrils, be repeatedly waſhed; and as ſoon

Comata as practicable, get the patient to drink some cold water. But if the case be too far gone to be thus relieved, let a healthy person breathe into the mouth of the patient; and gently force air into the mouth, throat, and nostrils. Frictions, cupping, bleeding, and blisters, are likewise indicated. And if, after the instant danger is removed, a fever be excited, the method of cure must be adapted to the nature and prevailing symptoms of the fever."

With regard to the poison of opium, Dr Mead recommends the following method of cure. Besides evacuations by vomiting, bleeding, and blistering, acid medicines and lixivial salts are proper. These contract the relaxed fibres, and by their diuretic force make a depletion of the vessels. Dr Mead says he hath given repeated doses of a mixture of salt of wormwood and juice of lemons, with extraordinary success. But nothing perhaps is of greater consequence, than to use proper means for the prevention of sleep, by rousing and stirring the patient, and by forcing him to walk about; for if he be once permitted to fall into a sound sleep, it will be found altogether impossible to awake him.

Of a kind somewhat akin to the poison of opium seems to be that of laurel-water, a simple water distilled from the leaves of the lauro-cerasus or common laurel. The bad effects of this were first observed in Ireland, where it had been customary to mix it with brandy for the sake of the flavour; and thus two women were suddenly killed by it. This gave occasion to some experiments upon dogs, in order to ascertain the malignant qualities of the water in question; and the event was as follows: All the dogs fell immediately into totterings and convulsions of the limbs, which were soon followed by a total paralysis, so that no motion could be excited even by pricking or cutting them. No inflammation was found upon dissection, in any of the internal membranes. The most remarkable thing was a great fulness and distension of the veins, in which the blood was so fluid, that even the lymph in its vessels was generally found tinged with red. The same effects were produced by the water injected into the intestines by way of clyster.

To make the experiment more fully, Dr Nicholls prepared some of this water so strong, that about a drachm of heavy essential oil remained at the bottom of three pints of it, which by frequent shaking was again quite incorporated with it. So virulent was this water, that two ounces of it killed a middle-sized dog in less than half a minute, even while it was passing down his throat. The poison appeared to reside entirely in the above-mentioned essential oil, which comes over by distillation, not only from the leaves of laurel, but from some other vegetables; for ten drops of a red oil distilled from bitter almonds, when mixed with half an ounce of water, and given to a dog, killed him in less than half an hour.

Volatile alkalies are found to be an antidote to this poison; of which Dr Mead gives the following instance. About an ounce of strong laurel-water was given to a small dog. He fell immediately into the most violent convulsions, which were soon followed by a total loss of his limbs. When he seemed to be expiring, a vial of good spirit of sal ammoniac was held to his nose, and a small quantity of the same forced down his throat: he instantly felt its virtue; Apoplexia. and by continuing the use of it for some time, he by degrees recovered the motion of his legs; and in two hours walked about with tolerable strength, and was afterwards quite well.

With regard to the pernicious effects of cold, there is no other way of counteracting them but by the application of external heat. We are apt to imagine, that the swallowing considerable quantities of ardent spirits may be a means of making us resist the cold, and preventing the bad effects of it from arising to such an height as to destroy life; but these do not appear to be in the least possessed of any such virtue in those countries liable to great excesses of cold. The Peruvian bark, by strengthening the solids, as well as increasing the motion of the fluids, is found to answer better than any other thing as a preservative: but when the pernicious effects have already begun to discover themselves, nothing but increasing by some means or other the heat of the body can possibly be depended upon: and even this must be attempted with great care; for as, in such cases, there is generally a tendency to mortification in some of the extremities, the sudden application of heat will certainly increase this tendency to such a degree as to destroy the parts. But for the external treatment of such mortifications, see the article SURGERY.

Sp. VII. APOPLEXY from *Passions* of the *Mind*. 262

Carus a pathemate, *Sauv.* sp. 11.
Asphyxia a pathemate, *Sauv.* sp. 7.
Ecstasis catoche, *Sauv.* sp. 1.
Ecstasis resoluta, *Sauv.* sp. 2.

APOPLEXIES from violent passions may be either sanguineous or serous, though more commonly of the former than the latter species. The treatment is the same in either case. Or they may partake of the nature of catalepsy; in which case the method of treatment is the same with that of the genuine catalepsy.

Sp. VIII. The *Cataleptic* APOPLEXY. 263

Catalepsis, *Sauv.* gen. 176. *Lin.* 129. *Vog.* 230. *Sag.* gen. 281. *Boerh.* 1036. *Junck.* 44.

Dr CULLEN says he has never seen the catalepsy except when counterfeited; and is of opinion that many of those cases related by other authors have also been counterfeited. It is said to come on suddenly, being only preceded by some langour of body and mind; and to return by paroxysms The patients are said to be for some minutes, sometimes (though rarely) for some hours, deprived of their senses, and all power of voluntary motions; but constantly retaining the position in which they were first seized, whether lying or sitting; and if the limbs be put into any other posture during the fit, they will keep the posture in which they are placed. When they recover from the paroxysm, they remember nothing of what passed during the time of it, but are like persons awaked out of sleep. —Concerning the cure of this disorder we find nothing that can be depended upon among medical writers.

Sp. IX. APOPLEXY from *Suffocation*. 264

Asphyxia suspensorum, *Sauv.* sp. 4.
Asphyxia immersorum, *Sauv.* sp. 1.

This

Comata

Paralyſis.

This is the kind of apoplexy which takes place in thoſe who are hanged or drowned. For the treatment of thoſe perſons, ſee the articles Drowning and Hanging.

Beſides the ſpecies above-mentioned, the apoplexy is a ſymptom in many other diſtempers, ſuch as fevers both continued and intermitting, exanthemata, hyſteria, epilepſy, gout, worms, iſchuria, and ſcurvy.

265 Genus XLIII. PARALYSIS.
The Palsy.

Paralyſis, *Boerh.* 1057.
Hemiplegia, *Sauv.* gen. 170. *Lin.* 103. *Vog.* 220.
Paraplexia, *Sauv.* gen. 171.
Paraplegia, *Lin.* 102. *Vog.* 227.
Paralyſis, *Sauv.* gen. 169. *Lin.* 104. *Vog.* 226. *Junck.* 115.
Atonia, *Lin.* 120.

266 Sp. I. The *Partial Palsy*.

Paralyſis, *Sauv.* gen. 169. *Lin.* 104. *Vog.* 226. *Junck.* 115.
Paralyſis plethorica, *Sauv.* ſp. 1.
Paralyſis ſeroſa, *Sauv.* ſp. 12.
Paralyſis nervea, *Sauv.* ſp. 11.
Mutitas a gloſſolyſi, *Sauv.* ſp. 1.
Aphonia paralytica, *Sauv.* ſp. 8.

267 Sp. II. Hemiplegia, or *Palsy of one ſide of the* Body.

Hemiplegia, *Sauv.* gen. 170. *Lin.* 108. *Vog.* 228. *Sag.* gen. 276.
Hemiplegia ex apoplexia, *Sauv.* ſp. 7.
Hemiplegia ſpaſmodica, *Sauv.* ſp. 2.
Hemiplegia ſeroſa, *Sauv.* ſp. 10.

268 Sp. III. Paraplegia, or *Palsy of one half* of the Body taken *tranſverſely*.

Paraplexia, *Sauv.* gen. 171. *Sag.* gen. 277.
Paraplegia, *Lin.* 102. *Vog.* 227.
Paraplexia ſanguinea, *Sauv.* ſp. 2.
Paraplexia a ſpina bifida, *Sauv.* ſp. 3.
Paraplexia rheumatica, *Sauv.* ſp. 1.

Deſcription. The palſy under all the different forms here mentioned as particular ſpecies, ſhows itſelf by a ſudden loſs of tone and vital power in a certain part of the body. In the ſlighter degrees of the diſeaſe, it only affects a particular muſcle, as the ſphincter of the anus or bladder, thus occaſioning an involuntary diſcharge of excrements or of urine; of the muſcles of the tongue, which occaſions ſtammering, or loſs of ſpeech; of the muſcles of the larynx, by which the patient becomes unable to ſwallow ſolids, and ſometimes even liquids alſo.—In the higher degrees of the diſeaſe, the paralytic affection is diffuſed over a whole limb, as the foot, leg, hand, or arm; and ſometimes it affects a whole ſide of the body, in which caſe it is called *hemiplegia*; and ſometimes, which is the moſt violent caſe, it affects all the parts below the waſte, or even below the head, though this laſt be exceedingly rare. In theſe violent caſes, the ſpeech is either very much impeded, or totally loſt. Convulſions often take place in the ſound ſide, with the cynic ſpaſm or involuntary laughter, and other diſtortions of the face. Sometimes the whole paralytic part of the body becomes livid, or even mortifies before the patient's death; and ſometimes the paralytic parts gradually decay and ſhrivel up, ſo as to become much leſs than before. Whether the diſeaſe be more or leſs extended, many different varieties may be obſerved in its form. Sometimes there occurs a total loſs of ſenſe while motion is entire; in others a total loſs of motion with very ſlight or even no affection of ſenſe; and in ſome caſes, while a total loſs of motion takes place in one ſide, a total loſs of ſenſe has been obſerved on the other. This depends entirely on the particular nerves or branches of nerves in which the affection is ſituated; loſs of ſenſe depending on an affection of the ſubcutaneous nerves; and loſs of motion on an affection of theſe leading to the muſcles.

Cauſes, &c. Palſies moſt commonly ſupervene upon the different ſpecies of coma, eſpecially the apoplexy. They are alſo occaſioned by any debilitating power applied to the body, eſpecially by exceſſes in venery. Sometimes they are a kind of criſis to other diſtempers; as the colic of Poictou, and the apoplexy. The hemiplegia eſpecially often follows the laſt mentioned diſeaſe. Aged people, and thoſe who are by any other means debilitated, are ſubject to palſy; which will ſometimes alſo affect even infants, from the repulſion of exanthemata of various kinds. Palſies are alſo the infallible conſequences of injuries of the large nerves.

Prognoſis. Except in the ſlighter caſes of palſy, we have little room to hope for a cure; however, death does not immediately follow even the moſt ſevere paralytic affections. In an hemiplegia it is not uncommon to ſee the patients live ſeveral years; and even in the paraplegia, if death do not enſue within two or three weeks, it may not take place for a conſiderable time. It is a promiſing ſign when the patient feels a ſlight degree of painful itchineſs in the affected parts; and if a fever ſhould ariſe, it bids fair to cure the palſy. When the ſenſe of feeling remains, there is much more room to hope for a cure than where it is gone, as well as the power of motion. But when we obſerve the fleſh to waſte, and the ſkin to appear withered and dry, we may look upon the diſeaſe to be incurable. Convulſions ſupervening on a palſy are a fatal ſign.

Cure. Many remedies have been recommended in palſies; but it muſt be confeſſed, that, except in the ſlighter caſes, medicines ſeldom prove effectual; and before any ſcheme of cure can be laid down, every circumſtance relative to the patient's habit of body and previous ſtate of health ſhould be carefully weighed. If an hemiplegia or paraplegia ſhould come on after an apoplexy, attended with thoſe circumſtances which phyſicians have ſuppoſed to denote a viſcid ſtate of the blood, a courſe of the attenuant gums, with fixed alkaline ſalts, and chalybeate waters, may do ſervice; to which it will be proper to add frictions with the volatile liniment all down the ſpine: but in habits where the blood is rather inclined to the watery ſtate, it will be neceſſary to give emetics from time to time; to apply bliſters, and cut iſſues.

The natural hot baths are often found uſeful in paralytic caſes; and where the patients cannot avail themſelves of theſe, an artificial bath may be tried by diſſolving

Comata diſſolving ſalt of ſteel in water, and impregnating the water with fixed air. Frictions of the parts, and ſcourging them with nettles, have alſo been recommended, and may do ſervice, as well as volatile and ſtimulating medicines taken inwardly. And it is probably by operating in this manner, that the uſe of camphor, or a mercurial courſe continued for ſome length of time to ſuch a degree as gently to affect the mouth, have been found productive of a cure in obſtinate caſes of this affection. Of late years, an infuſion of the arnica montana or German leopard's bane, has been highly extolled in the cure of this diſeaſe by ſome foreign writers: but the trials made with it in Britain, particularly at Edinburgh, have been by no means equally ſucceſsful with thoſe related by Dr Collins, who has ſtrongly recommended this medicine to the attention of the public.

269 Sp. IV. The Palsy from *Poiſons*.

Paralyſis metallariorum, *Sauv.* ſp. 22.
Hemiplegia ſaturnina, *Sauv.* ſp. 14.

This kind of palſy ariſes moſt frequently from lead taken into the body, and is a conſequence of the colica pictonum, under which it is more particularly treated.

270 TREMOR, or Trembling.

Tremor, *Sauv.* gen. 129. *Lin.* 139. *Vog.* 184. *Sag.* 236.

This by Dr Cullen is reckoned to be always ſymptomatic either of palſy, aſthenia, or convulſions; and therefore need not be treated of by itſelf.

271 Order II. ADYNAMIÆ.

Adynamiæ, *Vog.* Claſs VI.
Defectivi, *Lin.* Claſs VI. Order I.
Leipopſychiæ, *Sauv.* Claſs VI. Order IV. *Sag.* Claſs IX. Order IV.

272 Genus XLIV. SYNCOPE.
Fainting.

Syncope, *Sauv.* gen. 174. *Sag.* 94. *Vog.* 274. *Sag.* 280. *Junck.* 119.
Leipothymia, *Sauv.* gen. 173. *Lin.* 93. *Vog.* 273. *Sag.* 279.
Aſphyxia, *Sauv.* gen. 175. *Lin.* 95. *Vog* 275. *Sag.* 281.
Virium lapſus et animi deliquia. *Hoffm.* III. 267.

273 Sp. I. The *Cardiac* Syncope.

Syncope plethorica, *Sauv.* ſp. 5. *Senac.* Tr. de Cœur, p. 540.
Syncope a cardiogmo, *Sauv.* ſp. 7. *Senac.* de Cœur, 414. *Morgagn.* de Sed. XXV. 2. 3. 10.
Syncope a polypo, *Sauv.* ſp. 8. *Senac.* p. 471.
Syncope ab hydrochardia, *Sauv.* ſp. 12. *Senac.* 533. *Schreiber* Almag. L. III. § 196.
Syncope *Lanzoni*, *Sauv.* ſp. 18. *Lanzon.* Op. II. p. 462.
Aſphyxia Valſalviana, *Sauv.* ſp. 13.

274 Sp. II. *Occaſional* Syncope.

Leipothymia a pathemate, *Sauv.* ſp. 1. *Senac.* p. 544.

Syncope. Syncope pathetica, *Sauv.* ſp. 21.
Aſphyxia a pathemate, *Sauv.* ſp. 7.
Syncope ab antipathia, *Sauv.* ſp. 9. *Senac.* p. 544.
Syncope a veneno, *Sauv.* ſp. 10. *Senac* p. 540.
Syncope ab apoſtematis, *Sauv.* ſp. 11. *Senac.* p. 554.
Syncope a ſphacelo, *Sauv.* ſp. 14. *Senac.* p. 553.
Syncope ab inantione, *Sauv.* ſp. 1. *Senac.* p. 536.
Syncope a phlebotomia, *Sauv.* ſp. 4.
Syncope a dolore, *Sauv.* ſp. 2. *Senac.* p. 583.
Aſphyxia traumatica, *Sauv.* ſp. 14.
Aſphyxia neophytorum, *Sauv.* ſp. 17.

Deſcription. A ſyncope begins with a remarkable anxiety about the heart; after which follows a ſudden extinction, as it were, not only of the animal powers and actions, but alſo of the vital powers, ſo that the patients are deprived of pulſe, ſenſe, and motion, all at once. In thoſe caſes which phyſicians have diſtinguiſhed by the name of *leipothymia*, the patient does not entirely loſe his ſenſes, but turns cold and pale; and the pulſe continues to beat, though weakly; the heart alſo ſeems to tremble rather than beat; and the reſpiration is juſt perceptible But in the true ſyncope or full aſphyxia, not the ſmalleſt ſign of life can be perceived; the face hath a death-like paleneſs, the extremities are cold, the eyes ſhut, or at leaſt troubled; the mouth ſometimes ſhut, and ſometimes gaping wide open; the limbs flaccid, and the ſtrength quite gone; as ſoon as they begin to recover, they fetch deep and heavy ſighs.

Cauſes, &c. Fainting is occaſioned moſt commonly by profuſe evacuations, eſpecially of blood; but it may happen alſo from violent paſſions of the mind, from ſurfeits, exceſſive pain, &c. People of delicate conſtitutions are very ſubject to it from ſlight cauſes; and ſometimes it will ariſe from affections of the heart and large veſſels not eaſy to be underſtood. Fainting is alſo a ſymptom of many diſorders, eſpecially of that fatal one called a *polypus of the heart*, of the plague, and many putrid diſeaſes.

Prognoſis. When fainting happens in the beginning of any acute diſtemper, it is by no means a good omen; but when it takes place in the increaſe or at the height of the diſeaſe, the danger is ſomewhat leſs; but in general, when fainting comes on without any evident cauſe, it is to be dreaded. In violent hæmorrhagies it is favourable; as the bleeding veſſels thus have time to contract and recover themſelves, and thus the patient may eſcape.

Cure. When perſons of a full habit faint through exceſs of paſſion, they ought to be blooded without delay, and ſhould drink vinegar or lemon-juice diluted with water; and, after the bowels are emptied by a clyſter, take a paregoric draught, and go to bed.

The paſſion of anger, in a peculiar manner, affects the biliary ſecretion, cauſes an oppreſſion at the ſtomach, with nauſea and retching to vomit, and a bitter taſte in the mouth, with giddineſs: theſe ſymptoms ſeem to indicate an emetic; which, however, in theſe caſes muſt be carefully avoided, as it might endanger the patient, by bringing on an inflammation of the ſtomach.

The general effects of a ſudden fright have been mentioned on a former occaſion. When theſe are ſo violent as to require medical aid, our firſt endeavours

Adynamiæ must be to take off the spasmodic constriction, and restore freedom to the circulation; by bleeding, if the habit be at all inclined to fulness; and by giving a mixture, with equal parts of the vinum antimoniale and tinctura opii camphorata, in some agreeable vehicle, which will bring on sleep and encourage perspiration. It was formerly mentioned, that convulsions, or even an epilepsy, may be brought on by frights; which should make people cautious of playing foolish tricks in this way.

When a surfeit, or any species of saburra, occasions a leipothymia, an emetic is the immediate remedy, as soon as the patient, by the help of acrid stimulants, shall be so far roused as to be able to swallow one: in these cases, tickling the fauces with a feather dipt in spirit of hartshorn, will be proper, not only to rouse the patient, but also to bring on vomiting.

A syncope is most commonly brought on by profuse discharges or evacuations, either of the blood or of the secreted humours.

In order to revive the patients, they ought to be laid along in a horizontal posture, in an airy place; the legs, thighs, and arms, are to be rubbed with hot flannels; very strong vinegar, or salt of hartshorn, or volatile alkaline spirit, are to be held to the nostrils, and rubbed into them; or, being properly diluted, poured down the throat; cold water is to be sprinkled on the face and neck; and when by these means the patient shall be sufficiently revived, wine boiled up with some grateful aromatic, is to be given in the proper quantity.

In the fainting consequent upon profuse uterine hæmorrhagies, it will be a safer practice to abstain from all heating and stimulant things; as life, in these cases, is preserved by the coagulation of the blood in the extremities of the open vessels; which might be prevented by the pouring in hot wine or volatile alkaline spirits.

When a syncope is the consequence of the too violent operation of either an emetic or cathartic, the tinctura thebaica, mixed with spiced wine, is the most efficacious remedy; but the opiate must be given gradually, and in very small doses.

A syncope, or even asphyxia, wherein the patient shall lie for several hours, is frequent in hysteric constitutions; and during the fit requires fetid antispasmodics, together with acrid stimulants: to prevent returns, nothing answers better than the Peruvian bark joined with chalybeates.

275. GENUS XLV. DYSPEPSIA.
Depraved DIGESTION.

Dyspepsia, *Vog.* 277.
Apepsia, *Vog.* 276.
Diaphora, *Vog.* 278.
Anorexia, *Sauv.* gen. 162. *Lin.* 116. *Sag.* gen. 286.
Cardialgia, *Sauv.* gen. 202. *Lin.* 48. *Vog.* 157. *Sag.* gen. 160.
Gastrodynia, *Sauv.* gen. 203. *Sag.* gen. 161.
Soda, *Lin.* 47. *Vog.* 161.
Nausea, *Sauv.* gen. 250. *Lin.* 182. *Vog.* 159. *Sag.* gen. 185.
Vomitus, *Sauv.* gen. 251. *Lin.* 183. *Vog.* 214. *Sag.* gen. 186.
Flatulentia, *Sauv.* gen. 272. *Lin.* 165. *Vog.* 127. *Sag.* gen. 207. Dyspepsia.

The idiopathic species are,

Anorexia pituitosa. *Sauv.* sp. 2.
Anorexia a saburra, *Sauv* sp. 0.
Anorexia exhaustorum, *Sauv* sp. 8.
Anorexia paralytica, *Sauv.* sp. 1.
Nausea ex cacochylia, *Sauv.* sp. 11.
Vomitus pituitosus, *Sauv.* sp. 26.
Vomitus ruminatio, *Sauv.* sp. 6.
Vomitus a saburra, *Sauv.* sp. 2.
Vomitus a crapula, *Sauv.* sp. 1.
Vomitus lacteus, *Sauv.* sp. 3.
Flatulentia infantilis, *Sauv.* sp. 5.
Flatulentia acida, *Sauv.* sp. 1.
Flatulentia nidrosa, *Sauv.* sp. 2.
Cardialgia bradypepta, *Sauv* sp. 9.
Cardialgia a saburra, *Sauv.* sp 2.
Cardialgia lactantium, *Sauv.* sp. 11.
Cardialgia flatulenta, *Sauv.* sp. 3.
Cardialgia paralytica, *Sauv.* sp. 7.
Gastrodynia saburralis, *Sauv.* sp. 1.
Gastrodynia flatulenta, *Sauv.* sp. 2.
Gastrodynia periodynia, *Sauv.* sp. 7.
Gastrodynia astringens, *Sauv.* sp. 9.
Gastrodynia atterens, *Sauv.* sp. 10.
Gastrodynia a frigore, *Sauv.* sp. 18.

Besides these there are a great number of symptomatic species.

Description. It is by no means easy to define exactly the distemper called *dyspepsia*, when considered as an original disease, as there are very few maladies which some way or other do not show themselves by an affection of the stomach; and much more difficult still must it be to enumerate all its symptoms. The most remarkable, however, and the most common, are the following: Want of appetite; distention of the stomach when no food has been taken for some time before; slight dejection of spirits: a gradual decay of the muscular strength; languor, and aversion from motion; the food which is taken without appetite is not well digested; the stomach and intestines are much distended with flatus, whence the patients are tormented with spasms, gripes, and sickness: frequently a limpid water, having an acid or putrid taste, is brought up; sometimes the food itself is thrown up by mouthfuls; and sometimes, though rarely, the same is swallowed again, after the manner of ruminating animals. While matters are in this situation, the heart sometimes palpitates, and the breath is quick, and drawn with difficulty; the head achs and is giddy; and sometimes both these symptoms are continual, and very violent, insomuch that the patient is not only tormented with pain, but staggers as if he was drunk. From the too great acescency or putrefaction of the aliment, a cardialgia or heartburn comes on; and in this situation a spontaneous diarrhœa sometimes carries off the disease; but in other cases there is an obstinate costiveness, attended with colic-pains. Frequently the pulse is quick, sometimes slow, but always weak: the circulation is so languid, that the blood can scarce reach the extreme vessels, or at least stagnates.

Adynamiæ stagnates in them, so that the face becomes livid, swelled, and has an unusual appearance: and at the same time that the circulation and nervous power are in this languid state, the perspiration becomes less copious; the skin becomes dry and corrugated; the natural heat, especially of the extremities, is much diminished; the tongue is white; and an universal laxity takes place, insomuch that the uvula and velum pendulum palati are sometimes enlarged to such a degree as to become extremely troublesome. The patient is either deprived of rest, or wakes suddenly out of his sleep, and is disturbed by frightful dreams; at the same time that the mind seems to be affected as well as the body, and he becomes peevish, fretful, and incapable of paying attention to any thing as usual. At last hectic symptoms come on, and the whole frame becomes so irritable, that the slightest cause excites an universal tremor, and sometimes violent vomiting and diarrhœa. Sometimes the salivary glands are so relaxed, that a salivation comes on as if excited by mercury; the serum is poured out into the cavity of the abdomen and cellular substance of the whole body, and the patient becomes affected with anasarca or ascites.

Causes, &c. The causes of dyspepsia may be any thing which debilitates the system in general, but in a particular manner affects the stomach. Such are opium taken in immoderate quantities, which hurts by its sedative and relaxing powers; spirituous liquors drunk to excess; tobacco, tea, coffee, or any warm relaxing liquor, taken in too great quantity; acid, unripe fruits; vomits or purges too frequently taken; an indolent sedentary life, &c. &c. All these act chiefly upon people of a weak and delicate habit; for the robust and hardy seldom labour under a dyspepsia, or at most a very slight one.

Prognosis. When a dyspepsia first occurs, it is frequently removed without great difficulty; when it is symptomatic, we must endeavour to cure the primary disease; and without this we cannot expect a complete removal of the affection: but when it frequently returns with symptoms of great debility, hectic fever, or dropsy, we have great reason to dread the event.

Cure. A radical cure of dyspepsia is only to be expected by removing from the stomach and system that debility on which the disease depends. On this ground, the objects chiefly to be aimed at in the cure are, 1st, The avoiding whatever will tend to diminish the vigour of the stomach; 2d, The employing such remedies as have influence in encreasing that vigour; and, in the third place, The obviating urgent symptoms, particularly those which tend to increase and support the affection. Of the avoiding causes, which tend to diminish the vigour of the stomach, after what has already been said of the causes inducing the disease, it is unnecessary to make any farther observations; and indeed every dyspeptic patient will be taught by experience what is to be done with this intention The medicines chiefly employed with the view of increasing vigour are those of the tonic kind: but, previous to their use, it will be necessary to evacuate the contents of the alimentary canal by vomits or purgatives. If there be a tendency to putrescency, antiseptics must then be exhibited; but more frequently there is a prevailing acidity, which creates an intolerable heart-burn. To palliate this symptom, magnesia alba may be given; which is much preferable to the common testaceous powders, as being purgative while dissolved in an acid, when the others are rather astringent. In the third volume of the Medical Observations, we have an account of two cases of dyspepsia attended with a very uncommon degree of cardialgia, in which magnesia was so successful, that we can scarce doubt of its efficacy in slighter degrees of the disorder. They were communicated by Dr Watson. Dyspepsia.

"A woman, aged 34, the mother of several children, was taken, in the fourth month of her pregnancy, with violent vomitings; which growing daily worse, notwithstanding the endeavours of her apothecary to restrain them, brought on at the end of a month such severe pains in the stomach, and spasms in her abdomen, as to occasion abortion. The vomitings were not lessened by this event, but grew worse, and frequently brought on general convulsions to such a degree, that she was many times supposed to be at the point of death.

"Scarce any medicine staid with her; she brought up almost instantly whatever was given her as nourishment, either in a solid or liquid form. She was exceedingly pale, and very much emaciated; her flesh was cold to the touch; and, though her urine was little in quantity, it was perfectly limpid. She had a continual thirst, and was, in a considerable degree, costive. Her pulse was low and quick, and she was frequently tormented with the hiccough. The pain in her stomach was severe and constant; and whatever she brought up was sharp to such a degree as to make her mouth and throat very sore. These parts upon examination appeared high-coloured, and in many places excoriated; and the pain she felt in her stomach upon swallowing any liquor that had the least degree of acrimony, or was more than luke-warm, made it probable the stomach itself, in its internal surface, was affected in the same manner.

"In this wretched state I was consulted; and must confess that I was much at a loss how to relieve a patient so debilitated, and whose stomach was in so diseased a state, that it seemed incapable of retaining any appropriated remedies long enough to correct the acrimony of the juices, and restore the secretions to a more mild and natural state. Anti-emetics of various kinds had been tried without effect, particularly saturated solutions of alkaline salt in juice of lemons. Stomachic medicines of the warm and aromatic kind she could not bear, on account of their poignancy; and, though nothing could so speedily correct the almost caustic acid of the gastric juice as solutions of alkaline salts, neither the fauces nor gullet could bear their acrimony.

"My expectations of relieving this patient, small as they were, depended upon my being able to neutralize, and thereby lessen, the stimulus of the acid of the stomach. To accomplish this was not very easy, as no medicine in small doses could in any considerable degree correct so intense an acid; and, in the present situation, it was difficult to get any medicine to stay long enough to exert its effects. To discharge however what acrid matter might be already accumulated in

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in the ſtomach, I directed that the patient ſhould drink plentifully of ſmall, warm, unſalted mutton-broth, and vomit with it ſo long that it ſhould be diſcharged with no other taſte than that of broth. This was complied with, and a large quantity drank. The pain in her ſtomach ceaſed upon this for more than two hours, and was after that time apparently coming on with the ſame violence as before. Upon which I ordered a drachm of magneſia to be given in two ounces of veal-broth. This kept down, and eaſed her; I therefore directed the ſame doſe to be repeated as often as the pain returned, without any regard to the quantity that the whole might amount to, ſuppoſing that the pain continued ſevere. This was done; and in three days ſhe took three ounces of magneſia, of which very few doſes were vomited up, and ſhe was purged conſiderably.

"This medicine was continued in a ſomewhat leſs quantity for three days longer, in which ſhe took two ounces more of magneſia; by this time the vomitings ceaſed, the convulſions left her, ſhe had no pains in the ſtomach, and her mouth and fauces loſt their intenſely red colour and ſoreneſs; nor did even her eructations longer indicate any acidity.

"Beſides veal-broth ſhe was allowed boiled rice, and now and then ſome rice gruel with a ſmall quantity of brandy; and after a few days more ſhe could retain boiled chicken, and other light, ſolid, animal food.

"When her ſtomach was in this ſtate, ſhe took liberally of *decoct. cort. Peruvian.* with a ſmall portion of French brandy; by which and her nouriſhment ſhe recovered her ſtrength ſurpriſingly. To this medicine, as ſhe was during the latter part of her illneſs conſiderably anaſarcous, were added ſome preparations of ſteel; and in about a month ſhe perfectly recovered.

"When this patient's ſtomach was relieved, the thirſt, the general and partial ſpaſms, and other complaints, which were merely ſymptomatic, ſoon ceaſed; and what remained of her cure was by no means difficult.

"Since the above-recited caſe, I was conſulted in another almoſt in every reſpect ſimilar, except that the former began in pregnancy. The vomitings attended with acidity had continued more than a month; the patient's ſtomach rejected every kind of food and medicine; ſhe was debilitated to a great degree, and univerſally anaſarcous.

"Upon being ſent for, I directed for her magneſia, much in the ſame manner as for the former patient; and in a very few days her vomitings ceaſed, her ſtomach became ſtronger, and in leſs than a fortnight the anaſarca diſappeared. But it was a conſiderable time, as this perſon was more advanced in years than the former, before ſhe recovered her ſtrength, notwithſtanding my beſt endeavours for that purpoſe. She at length, however, perfectly recovered."

But although acidity may often be ſucceſsfully obviated in this manner, yet the beſt way of counteracting this ſymptom, as well as of obviating coſtiveneſs, flatulence, and a variety of others, is by reſtoring the tone of the ſtomach in particular, and indeed of the ſyſtem in general. With this intention, recourſe is had to a variety of tonics both from the mineral and vegetable kingdom; particularly chalybeates in different forms, gentian, colombo, and the like; but of all the tonics which can be employed in this affection, none are attended with greater benefit than exerciſe and cold bathing; and the proper and prudent employment of theſe is no leſs effectual in removing the diſeaſe, than in preventing the return of it after it is once removed.

Dyſpepſia.

Genus XLVI. HYPOCHONDRIASIS. 276
Hypochondriac Affection.

Hypochondriaſis, *Sauv.* gen. 220. *Lin.* 76. *Vog.* 218. *Sag.* 332.
Morbus hypochondriacus, *Boerh.* 1098.
Malum hypochondriacum, *Hoffm.* III. 65. *Junck* 36.

Although ſome of the noſological writers, particularly Sauvages, have conſidered this genus as conſiſting of different ſpecies, Dr Cullen is of opinion, that there is only one idiopathic ſpecies, the *hypochondriaſis melancholica.* He conſiders not only the hypochondriaſis hyſterica, phthiſica, and aſthmatica, but alſo the bilioſa, ſanguinea, and pituitoſa, as being only ſymptomatic; but he views the true melancholic hypochondriaſis as being a proper idiopathic diſeaſe, perfectly diſtinct from hyſteria, with which it has often been confounded.

Deſcription. The ſymptoms of hypochondriaſis are, ſtretching, preſſing, griping, and tormenting pains, under the ribs, and chiefly in the left ſide; which ſometimes are exaſperated, and become pungent, burning, or lancinating. Frequently there is an inflation of the left hypochondriacum, which ſometimes becomes ſtationary, and by Hippocrates was taken for a ſymptom of an enlarged ſpleen. When theſe ſymptoms take place in the right hypochondrium, they are commonly attended with colic-pains, uncertain flying heats, eſpecially in the head, with a tranſient redneſs of the face, and very frequently an œdematous ſwelling of the feet ſucceeds. To theſe are ſuperadded almoſt all the affections of the ſtomach occurring in dyſpepſia, beſides a variety of other ſymptoms, ſuch as palpitations, ſleepleſs nights, and the like. But beſides theſe, there occurs alſo a particular depreſſion of ſpirit and apprehenſion of danger, which may be conſidered as one of the great characteriſing ſymptoms of the diſeaſe.

Cauſes, &c. The general cauſes of the hypochondriac affection are ſaid to be a plethora, and preternatural thickneſs of the blood; ſuppreſſions of cuſtomary evacuations; high and full diet, together with a ſparing quantity of drink; an hereditary diſpoſition; indolence; atony of the inteſtines; violent paſſions of the mind, &c.

Prognoſis. The hypochondriac affection, when left to itſelf, is more troubleſome than dangerous; but, if improperly treated, it may bring on various diſeaſes of a more fatal tendency, ſuch as the melancholy, bloody urine and nephritis, jaundice, vertigo, palſy, apoplexy, &c.

Cure. This is to be attempted by ſuch medicines as counteract occaſional cauſes, and obviate urgent ſymptoms, Dynamiæ symptoms, which may be all comprehended under bleeding, gentle evacuants, chalybeates, the Peruvian bark, and exercise, especially riding on horseback, which in this disease is greatly preferable to any other. When the circumstances of the patient can afford it, a voyage to Spain, Portugal, or some of the warmer countries in Europe, will be of great service.

277 GENUS XLVII. CHLOROSIS.
GREEN SICKNESS.

Chlorosis, *Sauv.* gen. 309. *Lin.* 222. *Vog.* 305. *Sag.* gen. 135. *Boerh.* 1285. *Hoffm.* iii. 311. *Junck.* 86.

Of this genus also Dr Cullen thinks there is but one idiopathic species: viz. what some distinguish by the title of *chlorosis virginea*, others of *chlorosis amatoria*.

Description. This disease usually attacks girls a little after the time of puberty, and first shows itself by symptoms of dyspepsia. But a distinguishing symptom is, that the appetite is entirely vitiated, and the patient will eat lime, chalk, ashes, salt, &c. very greedily; while at the same time there is not only a total inappetence to proper food, but it will even excite nausea and vomiting. In the beginning of the disease, the urine is pale, and afterwards turbid; the face becomes pale, and then assumes a greenish colour; sometimes it becomes livid or yellow: the eyes are sunk, and have a livid circle round them; the lips lose their fine red colour; the pulse is quick, weak, and low, though the heat is little short of a fever, but the veins are scarcely filled; the feet are frequently cold, swell at night, and the whole body seems covered with a soft swelling; the breathing is difficult: nor is the mind free from affection as well as the body; it becomes irritated by the slightest causes; and sometimes the patients love solitude, become sad and thoughtful. There is a retention of the menses throughout the whole course of the disorder; and at last all the bad symptoms increasing, a leucophlegmasia, anasarca, atrophy, and death, succeed.

Causes. The cause of chlorosis is thought to be an atony of the muscular fibres of the alimentary canal, especially of the stomach, joined with a similar atony of the perspiratory vessels over the whole surface of the body, and the whole depending on an atony of those small arteries which pour out the menstrual blood. This atony may be occasioned by the same causes which bring on dyspepsia and hypochondriasis, but very frequently arises from love and other passions of the mind.

Prognosis. The chlorosis in all cases is tedious, though it does not generally prove fatal; but we can never promise a certain cure unless the menses make their appearance.

Cure. The remedies here in general are the same as in the dyspepsia and hypochondriasis; only in the chlorosis stronger purgatives may be made use of: those which stimulate the rectum are useful by stimulating also the vessels of the uterus; and for this reason indulgence in venery has sometimes been said to produce a cure, particularly with love-sick maids. The cold bath is also extremely proper.

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278 ORDER III. SPASMI.

Spasmi, *Sauv.* Class IV. *Vog.* Class V. *Sag.* Class VIII.
Motorii, *Lin.* Class VII.
Morbi spasmodici et convulsivi, *Hoffm.* III. 9.
Spasmi et convulsiones, *Junck.* 45, 54.
Epilepsia, *Boerh.* 1071, 1088.

GENUS XLVIII. The TETANUS. 279

Tetanus, *Sauv.* gen. 122. *Lin.* 127. *Vog.* 180. *Sag.* gen. 228.
Catochus, *Sauv.* gen. 123. *Lin.* 128. *Vog.* 183. *Sag.* gen. 229.
Opisthotonos, *Vog.* 181.
Episthotonos, *Vog.* 182.

On this distemper Dr Lionel Chalmers has published a dissertation in the first volume of the Medical Observations, which being superior to any thing that has appeared in other medical writers on the subject, we shall here lay before the reader.

"Of all the diseases to which man is subject, none deserves more to be considered than the opisthotonos and tetanus, either with regard to the variety of painful symptoms which almost without intermission distract the sick, or the danger of the diseases themselves, from which few recover, in comparison of the number they attack. In both, the vital actions are very imperfectly performed, most of those which are called *natural* being as it were suspended at once; and so far is the patient from being able to execute any voluntary motion, that the whole machine undergoes the most excruciating distortions, from the violent and unnatural contractions of the muscles. Happy it is for the inhabitants of the more temperate climates, that such diseases appear rarely among them; but in those countries which lie in the more southern and warmer latitudes, they are endemic, especially to negro slaves. In South Carolina, they show themselves at all seasons, but not so often in winter, more frequently in spring and autumn; and are most common in the summer, when people work abroad and are alternately exposed to the scorching heat of the sun and heavy showers, which often happen suddenly, and greatly alter the temperature of the air. Others are seized with the opisthotonos after sleeping without doors, that they may enjoy the deceitful refreshment of the cool night-air, when the weather is warm: one youth chose to cut off his hair and shave his head on a warm day in March, and went to bed without a cap; but the weather changed, and became cold in the night, and he was found rigid with that disease next morning.

"These diseases so rarely appear as originals in Europe, that a good history of them cannot be expected from the physicians who practise in that part of the world; nor has any thing like a full description been given of them by any ancient or modern author which I have seen. Hippocrates indeed takes notice of them in many places, and seems to regard them only as consequences of other diseases, or of wounds or ulcers of the nervous or tendinous parts, of which symptomatic kind of opisthotonos he gives three remarkable cases in *lib.* V. & VII. *de Morb. vulg.* and repeats

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repeats them in another place; but the few symptoms he recounts do not show themselves with us. Galen, Cœlius Aurelianus, Aretæus, &c. seem only to have copied Hippocrates, with the addition of some supposititious symptoms, which really do not appear; and the little that Bontius says of it is very faulty.

"Among the numerous class of spasmodic diseases, there are three which distinguish themselves in a very particular manner, on which the names of *emprosthotonos*, *opisthotonos*, and *tetanus*, have been justly enough bestowed, as being expressive of the posture into which they throw and confine the patient. When therefore those muscles which bend the head, neck, and body forwards, suffer such involuntary, violent, and continued contractions, as to fix the chin to the breast, incurvate the spine and body, and retain the sick in this painful and prone posture, the disease is called *emprosthotonos*. When the posterior muscles are similarly affected, so that the head is drawn towards the spine, and the spine itself is recurvated, it has then the name of *opisthotonos*; although in fact, in this, all those muscles which act in deglutition, bend the head forwards, or turn it to either side, are equally contracted with those which raise the head and spine. The *tetanus* differs from, or rather is compounded of, both the others; for in this the patient is found rigid and inflexible, being as it were braced between the opposite contractions of the anterior and posterior muscles; yet even here the head is much retracted

"I never saw the *emprosthotonos*; and shall only speak of the *opisthotonos* and *tetanus*, the first being by far the most common, and in the last stage of which the tetanus frequently supervenes. And let it be observed, that the following description by no means respects such symptomatic contractions as often happen immediately before death, both in acute and chronic diseases; neither will it agree with that spurious *opisthotonos* or *tetanus* which appear sometimes in the first and second stages of quotidian intermittents in this country, however they may emulate the true diseases in some of their symptoms.

"Stad. I. The *opisthotonos*, contrary to what Bontius asserts, often comes on gradually and by slight approaches, the patient complaining rather of an uneasy stiffness in the back-part of the neck and about the shoulders, than of any acute pain, with some degree of a general lassitude. These increase, and become so troublesome when he attempts to turn his head, or to bend it forward, as to oblige him to walk very erect; for he can by no means look downward, nor to either side, without turning his whole body. He cannot open his jaws without pain; and has some difficulty in swallowing, which discourages him from attempting to eat. At times he feels a sudden and painful traction under the *cartilago ensiformis*, which strikes thro' to the back, and instantly increases the rigidity about the neck and shoulders, draws the head backward a little, and shuts the jaws closer. The pain under the *sternum* returns more frequently and with greater violence; and the other contractions become so strong, that the head from this time continues much retracted, and he now refuses nourishment, as swallowing is attended with great pain, and occasions a return of the spasm; which extends along the spine quite to the lower extremities, so that they will no longer support him, and he is under the necessity of going to bed.

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"In this manner passes over the first stage of the *opisthotonos*, which sometimes takes up three or four days; the patient, as well as those about him, mistaking the first appearances of it for that rheumatic complaint, which is commonly called a *crick in the neck*; but it sometimes forms itself much quicker, and invades the unfortunate person with the whole train of its mischievous symptoms in a few hours: in which case, the danger may truly be estimated from the violence of the first attack; for such generally die in 24, 36, or 48 hours, and very rarely survive the third day. But when it is less acute, few are lost after the ninth or eleventh; which number of days it would not be possible for them to complete, unless the violence of the disease was in a good measure subdued; although I had one who recovered, after having been subject to its tyrannical attacks daily for six weeks. In this stage the pulse is slow, and very hard, and the belly is bound; blood taken away seems not to be altered from the natural state, so that no indication can be deduced therefrom, and it only varies with regard to laxity or compaction, according to the age of the person and season of the year.

"Stad. II. The spasm under the sternum (which is the pathognomic symptom of this disease) becomes more violent, returning every 10 or 15 minutes; and never fails to be instantly succeeded by a stronger retraction of the head, with great rigidity and pain all round the neck, and along the spine to the lower extremities which are suddenly put to the stretch. The countenance is very pale and contracted; the jaws are that moment snapped together, and cannot afterwards be opened so wide as to receive the end of one's little finger; an attempt to do which, by way of experiment, surely hurries on the spasm. The mastoid, coracohyoid and sternohyoid muscles, as well as all the others concerned in deglutition, and the deltoid and pectorals, are most violently contracted, so that the shoulders are strongly raised forward, and the arms are stretched out or drawn across the body; but the wrists and fingers seem not to be affected.

"Such is the condition of the patient in the time of the spasm, which ceases in a few seconds: after which the shoulders and arms recline, and the inferior extremities relax; yet not so entirely, but that such a degree of rigidity for the most part remains as will not permit them to bend when this is attempted by another person; for as to the sick himself, he cannot at all move them. The muscles on the sides and forepart of the neck continue still contracted, although not so strongly; but their action is overcome by the number and strength of the posterior ones; so that the retraction of the head constantly remains. He breathes quick for some minutes, as if he had been excessively exercised; and the pulse is small, fluttering, and irregular, but both become more calm and slow. The face is sometimes pale in the intervals, but oftener flushed; and the whole countenance expresses strong appearances of the most melancholy distress, as well because of the dread he has of a return of the spasm, which he is sure will soon happen, as from the pain he suffers by the present contractions, and the more general asmi general and severe ones which he has so lately sustained. The tongue is stiff and torpid; but so far as it can be seen, is not foul. The belly is always bound, and cannot easily be loosened. In drinking, the liquid passes with great difficulty to the stomach, even in the smallest quantity; and if the spasm should seize him at that time, which an attempt to swallow for the most part occasions, the liquor returns through the nose with some force. The patients desire to lie still as much as possible; and avoid drinking, speaking, or being moved, either of which are apt to occasion a return of the spasm.

"STAD. III. In this last stage, the patient is reduced to the most calamitous and distressful circumstances: for he is on a continual rack, according to the most literal meaning of that word; the spasm returning oftener than once in a minute, is much more violent, and holds him longer, so that he has scarcely any remission. The anterior muscles of the whole body now suffer equal contractions with the posterior; but the last overcome the force of the others, so that the spine is strongly recurvated, and forms a hollow arch with the bed, and he rests on the back part of the head and the heels. The belly is flat, and is drawn inward; and the muscles are so rigidly contracted, that they will not give way to pressure, and do not seem in the least to yield to the descent of the diaphragm in inspiration; the several muscles about the neck, sides, and abdomen, being plainly distinguishable from each other. Although the lower extremities are always rigid in this state, yet are they so suddenly and violently distended in the time of the spasms, that were it not for the standers-by, he would be projected feet foremost off the bed; while others again are as it were pushed upward with such a spring, that the head is struck with great force against whatever happens to be in the way, the thighs and legs being in this case no less rigid than the other parts. The tongue is spasmodically darted out, and is often miserably torn, as the teeth are that moment snapped together; so that it is necessary to prevent this by keeping the handle of a spoon, wrapped round with soft rags, between the teeth, when this can be done. At the time that the tongue is thus thrust out, the muscular flesh, which lies between the arch of the lower jaw and head of the trachea, seems to be drawn upwards within the throat. The countenance is very much contracted, and he is in a foam of sweat, the heat being very great; and the pulse between the spasms is exceeding quick, small, and irregular, although the heart throbs so strongly, that its motions may be plainly seen, and a palpitating subsultory kind of undulation may not only be felt, but perceived all over the epigastric region. The eyes are watery and languid, and a pale or bloody froth bubbles out from between the lips. The jaws are for the most part locked fast, so that it is impossible to give drink or nourishment, nor could he swallow if any thing was put into his mouth. In this state they are commonly delirious: and as they cannot subsist many hours under so great a suspension of the vital and natural functions, a mortal anxiety ensues and releases them; oftener a continued and severe spasm finishes the tragedy, when it was before almost at an end: but most frequently a general convulsion puts a period to their sufferings; and whichever way this happens, they for the most part relax just before death.

Tetanus.

"In the *tetanus*, the general symptoms are nearly the same as in the opisthotonos, except that from the first attack, the lateral, abdominal, and other anterior muscles, are equally contracted with the posterior ones; and the arms become rigid as well as the lower extremities. The abdomen is always flat and rigid as in the last stage of the opisthotonos, and its contents seem to be thrust up into the thorax, which at the same time appears to be much dilated. There are here also some intervals between the spasms, in the time of which the cheeks are drawn towards the ears, so that all the teeth may be seen as in the spasmus cynicus. Deglutition is more free in this than in the other disease; yet so far is the sick from being equally balanced between the contractions of the opposite muscles, that the head is retracted and the spine is recurvated, although not quite so much as in the opisthotonos. And the spasm, which commences under the sternum, is likewise common to the tetanus, which terminates as the other, and on the same fatal days. But whoever recovers from either, labours long under a general atonia; and they cannot for some months raise themselves from a supine or recumbent posture without pain, nor without help for some time."

Prognosis and Cure. There has never been any thing like a crisis observed in these frightful cases, or favourable termination from the mere efforts of nature; and therefore all the physician's dependence must be upon art. As in cases of tetanic affections, the disease often arises from some particular irritation, the removal of this must necessarily be an important object in the cure: But where it cannot be removed, benefit may often be obtained by the prevention of its influence being communicated to the brain. When, however, that influence is communicated to the brain, a cure is to be expected only by diminishing and obviating it. This is principally brought about by the use either of those means which have a general tendency to diminish action, or of those which induce a different state of action. On these grounds the operation of those remedies which are employed with greatest success in this affection, may, we apprehend, be explained. Fortunately it has been found, that opium is capable of giving some relief, if administered in proper time, and if the disease happens not to be in the most violent degree: the warm bath must also be brought in aid; and the patients should lie horizontally in the bath, and while in it have the whole body extremely well rubbed: when taken out, they are not to be dried, but immediately put to bed wrapt in the softest blankets; and while they remain there, the belly ought either to be stuped, or two or three bladders filled with warm water kept constantly lying on it. The bowels at the same time must, if possible, be kept open, by solutions of manna and *sal polychrest*, or some other purging salt, mixed with *oleum ricini*; or if that should not be at hand, with oil of sweet almonds and a little tincture of sena. The opiates are to be given in large and frequently repeated doses; such as a grain of the *extractum thebaicum*, or 25 drops of the tincture, every second or third hour; and it will be safest not to trust to the thebaic tincture which is kept ready prepared in the shops, but order the necessary dose of solid opium, and either give it in pills or dissolve it in

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ſome convenient liquid. If ſwallowing ſhould be difficult, or the jaws cloſed up, the opium muſt be given in clyſters; for during the whole courſe of the diſeaſe it will be of ſervice to order emollient clyſters to be injected from time to time, ſince theſe will anſwer not only as a relaxing fomentation, but alſo contribute to keep the inteſtinal canal perfectly free.

When the patients recover, they continue for a long time very relaxed and weak; and no wonder, ſince it is the nature of all ſpaſmodic affections to leave behind them extreme weakneſs and relaxation of the muſcular fibres. In order to perfect the recovery, a courſe of the Peruvian bark and the Peruvian balſam is to be tried; and the ſpine may be rubbed with ſpirituous liniments, or with a mixture of rum and Barbadoes tar: but theſe and all other ſtimulating things, either internally or externally, during the violence of the ſpaſms, muſt, in the opinion of ſome practitioners, be omitted, ſince all of them as well as bliſters have been alleged to exaſperate the diſeaſe.

This, in general, is the plan of treatment recommended by Dr Chalmers.

The ſame dreadful diſorders frequently attack young children in the warm climates. Dr Hillary tells us, that they will there ariſe from the ſame cauſes which uſually produce convulſions with children in Britain, *viz.* from a retention of the meconium or firſt excrement after birth; or from a glutinous matter which is too often found in the inteſtines of young children ſoon after the other is diſcharged; or from a cheeſy matter from the coagulation of the milk by an acid in the ſtomach; or from hard excrements; or from ſomething taken in by the mouth which is over acrid, or too hard to digeſt, which irritates their tender bowels, and ſo produces ſtartings and convulſive ſpaſms, with all the other ſymptoms which precede and accompany convulſions in young children in Britain. And this ſhows how much more readily and eaſily the nerves are affected and irritated in that warm climate, and the *tetanus* produced from a much leſs cauſe there, than it is in Britain, where it is but ſeldom ſeen. But theſe cauſes not being timely removed, their acrimony is increaſed, partly by the heat of the climate, and partly by the fever which they produce, which ſtill renders them more acrid, and ſo increaſes the irritation of their bowels, that it firſt brings on ſtartings, then convulſive ſpaſms, and regular convulſion fits; which, if not ſoon removed, uſually end in a perfect *tetanus* there, and the diſeaſe is but ſeldom cured in ſuch young children when it arrives at that ſtate: for when the child lies in this miſerable, rigid, immoveable condition, upon moving its hands or feet in the moſt gentle manner, or ſoftly touching any part of its body, or giving it the leaſt motion, even feeling its pulſe in the moſt gentle tender manner, or the leaſt noiſe, or even touching its clothes, will bring on the convulſive ſpaſms, and cauſe it to be ſtrongly convulſed backwards, or drawn into a rigid ſtraight line, ſtrongly extended and immoveable like a ſtatue, and will ſo remain immoveable out of either of thoſe poſtures for a conſiderable time, a minute or two; and when the diſeaſe is arrived at this degree, Dr Hillary thinks it is never cured. But if the phyſician be called in time, before the *tetanus* has come on (which is too ſeldom the caſe there), though he finds ſtrong convulſive ſpaſms have ſeized the child, or that it has had a convulſive fit or two, it may moſt commonly be relieved, the coming of the *tetanus* be prevented, and the life of the babe ſaved, as Dr Hillary has more than once ſeen, by removing and carrying off the irritating cauſe which ſtimulates their tender bowels, by ſuch gentle evacuations as are ſuitable to their age; and then quieting and compoſing the irritation of their nerves with proper anodynes, and correcting the remaining acrimony of the nutritious juices in the *primæ viæ*.

Tetanus.

To anſwer theſe intentions, the following method, with variations *pro re nata et pro ratione ætatis*, as the cauſe is different, has been found to anſwer the deſired effect the beſt: R. *Seri lactis* ℥ij. *Sapon. Venet.* ℈j. *Mannæ Calab.* ʒij. *vel* iij. *Ol. amygd. dul.* ℥ſs. *Ol. fæniculi dul. gut.* ij. *Balſ. Peruv. gut.* v. *Miſce, ft. enema quam primum injiciendum.*

And if the ſymptoms of the approaching *tetanus* will permit, he gives ſomething of the following nature to aſſiſt the operation of the clyſter, and to carry off the acrimony the ſooner: R. *Aq. fem. fæniculi* ℥iij. *Magneſ. albæ* ʒſs. *Ocul. cancr. præp.* ʒj. *Syr. e cichor. cum rheo, Roſar. ſolut. ana* ʒiij. *Miſce.* Or, R. *Aq. ſem. fæniculi* ʒiij. *Sapon. amygdal.* ʒſs. *Magneſ. albæ* ʒſs. *Syr. e cichor. cum rheo, Mannæ opt. ana* ʒij. *Ol. amygd. dul.* ʒiij. *Miſce: Exhibe cochl. parv. vel duo pro ratione ætatis omni ſemihora, vel omni hora, donec reſpond. alvus.*

Two or three ſtools being obtained by theſe, the following is exhibited in order to abate the convulſive twitchings, and prevent the *tetanus* from coming on: R. *Aq. ſem. fæniculi* ℥iij. *Magneſ. albæ* ʒſs. *Ocul. cancr. præp.* ʒj. *Moſchi orient. gr.* iij. *Spir. C. C. gut.* xv. *Syr. e mecon* ℥ſs. *Miſce: Exhibe cochl. parv.* (a child's ſpoonful) *ter quaterve de die, vel ſæpius, urgent. convulſ. vel ſpaſm.*

But if the ſymptoms ſhow that the *tetanus* is more immediately coming on, ſo that we have no time to wait till the operation of the clyſter and opening laxative be over, ſomething of the following nature muſt be immediately given; or the *tetanus* will come on, and moſt probably prove fatal to ſuch tender babes. R. *Aq. fæniculi* ʒiiij. *Moſchi orient. gr.* j. *Tinct. Thebaic. gut.* iiij. *Syr. e mecon.* ʒij. *Miſce pro duobus doſ. de quibus exhibe unam quam primum, et alteram ſi convul. ſpaſm. redeunt.*

This, Dr Hillary obſerves, may be thought a bold attempt, to give *tinct. Thebaica* to ſuch a tender young infant: but it is to be conſidered that the little patient will certainly die if the *tetanus* ſeize it, and that it will come on if this do not prevent it; and he has known a bold ignorant old midwife give four or five drops of that tincture to a very young infant without any prejudice more than its doſing three or four hours, though not in this caſe, but in one much leſs violent.

The clyſter may be given at the ſame time, and the opening laxative not long after it: though it may retard the operation of that for ſome time, yet it operates ſoon after, and gives relief; after which the other medicines, and fomenting the body and anointing it as before, may be uſed, if the phyſician finds it neceſſary; alſo a little of the laxative mixture may be given once or twice a-day, if the above julep does not anſwer

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anfwer that intention of keeping the child's body open for a few days afterwards, which in this cafe is generally found neceffary to be obferved.

Thefe methods and medicines may be varied according to circumftances. For neither the fame method nor the fame medicines will anfwer in all cafes, though the difeafe be the fame; but they muft be changed as the caufes differ, or the conftitution of the fick, or the time of the difeafe, or as fome other circumftances may require: which is a thing of great importance, not only in this, but in the cure of moft other difeafes; wherefore it is mentioned here, chiefly to caution the practitioners in the Weft Indies.

When proper medicines are thus timely and judicioufly given in this cafe, they feldom fail to carry off the irritating caufe, quiet and eafe the nerves, remove the convulfions and fpafms; and confequently prevent the tetanus from coming on, and the death of the patient. But if calling in the phyfician be deferred till the tetanus has already ftrongly feized the child, as is too often the cafe here, neither warm bathing, fomenting, nor any other methods or medicines whatever, will remove it or its caufes, nor fave the life of the little tender patient.

Dr Chalmers gives an account of his having cured one child feized with a *tetanus*, by purging with an infufion of rhubarb; to which a few grains of mufk, and a little *ol. tartar. per deliq.* were added, together with the warm bath, and the frequent injection of glyfters made with an infufion of camomile flowers, to each of which was added a fmall portion of Caftile foap. It is much to be regretted, however, that in thofe cafes where the affiftance of the medical art is moft wanted, it moft generally fails. We have been affured by a gentleman who practifed for fome time in the warm parts of America, that out of 30 cafes of the tetanus he had feen, not one of the patients recovered, though he had given opium to the quantity of 20 grains thrice a-day; and others, he was affured, had taken 30 grains thrice a-day. In the beginning of the difeafe, the medicine produced a violent headach; but towards the end, it had no manner of effect whatever. In two patients, the difeafe came on from the flighteft caufes imaginable. The one accidentally fell in attempting to avoid a loaded cart, and put the heel of his fhoe upon one of his thumbs in rifing; the other, in avoiding the fame cart, flightly ruffled the fkin of his nofe. Both were feized with the tetanus; and both died, notwithftanding all poffible affiftance was given. The former had his thumb amputated without effect.

In the Edinburgh Phyfical and Literary Effays, Vol. III. Dr Donald Monro defcribes a new method of cure, communicated to him by a gentleman who was formerly a practitioner in Jamaica. While this gentleman practifed in that ifland, he had under his care a great number of cafes of tetanus attended with the locked-jaw. At firft, he ufed to give very freely of opium, mufk, and other medicines of this clafs; to bleed, and make other evacuations; while he ufed baths, fomentations, embrocations, and other external applications, but all without the leaft fuccefs; and, as he had loft a great many patients without being fo lucky as to make one cure, he began to believe that this diforder always proved fatal, and was not to be cured by medicine, notwithftanding what fome practitioners had alleged. However, having received an unexpected hint concerning the good effects of the mercurial ointment in fuch cafes, he refolved to try it; and ordered the firft patient that offered to be put into a warm room, and to be rubbed two or three times a-day with the ointment, till fuch time as a falivation was raifed; when he with pleafure obferved, that, as foon as the mercury began to affect the mouth, the convulfions of the mufcles of the jaws, as well as all the other fpafms and convulfions, ceafed, and the patient was freed of all his complaints. After this, he treated every cafe of this kind which came under his care in the fame manner, and cured twelve, which were all who applied to him for advice fo early in the diforder that there was time to bring the mercury to the mouth before the fatal period was expected. A few died, in whom the difeafe was fo far advanced before he faw them that there was not time to raife a falivation. None of the cafes which were under this gentleman's care in the Weft Indies were the confequences of wounds or capital operations; nor has he had any opportunity of trying it fince in cafes of the locked jaw, which fometimes follows capital operations, owing to his having given over practice: but he thinks, that, from the fimilarity of the complaint, there is no doubt that the mercurial frictions would be equally efficacious in fuch cafes, as when the diforder comes from catching cold or other fuch caufes.

Tetanus.

In the fecond volume of the Medical Tranfactions, we have an account of a cure performed by Dr William Carter of Canterbury, by means very different from any of thofe above related.—On the 17th of May 1767, the doctor was called to a ftrong healthy man, in the 21ft year of his age, and who had been confined to his bed for three weeks. What gave rife to his prefent diforder was a wound on the inner ankle of his right leg, which he had received fix weeks before from a joiner's chifel. At that time his mouth was fo far clofed, as to admit only the moft liquid nourifhment, which he conftantly fucked through his teeth: but his legs and jaw, and the whole length of the fpina dorfi, were quite immoveable, being as ftiff and rigid as thofe of a perfon long dead; his head was drawn backward, and he was frequently ftrongly convulfed. The motion indeed of both his arms was but a little impaired. From the beginning to the end, his fight, hearing, and memory, continued perfect; his appetite was good; and his fenfes, in the day-time, entire, though fometimes wandering in the night. As to his pulfe, that was regular; if it deviated at all from the pulfe of a perfon in health, it was rather flow than quick, and fomewhat fuller than natural. Such was the fituation of his patient; a detail of which had been given before the doctor fet out on his journey, which he undertook with a determined refolution to make ufe of the method recommended by Dr Silvefter, in the firft vol. of Medical Obfervations and Inquiries, publifhed in the year 1757, (and which has been related from Dr Chalmers and Dr Hillary.) But, on his arrival at the houfe, he found great quantities of the *extractum thebaicum* diffolved had

Spafmi had been already given him; and that, for the five laft days, he had taken no lefs than 28 grains of that medicine, with 50 grains of mufk, in the fpace of 24 hours, without any fenfible effect, except the bringing on a confufed fleep, out of which he frequently awoke in great hurries, attended with a violent pain in the head, which almoft deprived him of his fenfes. The doctor was afraid to extend the dofe; and foon determined to take fome other method, though at a lofs what method to purfue, as, during a courfe of almoft 30 years practice, nothing of the fame kind had ever fallen under his cognizance before. Reflecting, however, that this diforder had always been deemed of the fpafmodic kind, and that the good effects produced by the *extractum thebaicum* muft probably be owing to the relaxing and refolving faculty of that medicine, he directed a blifter to be applied between the fhoulders, the whole length of the fpine; the jaw to be anointed with the *oleum lateritium*; and a purge, confifting of the *tinctura facra, tinctura jalappi*, and the *fyrupus de rhamno cathartico*, to be given him. This was repeated three feveral times afterwards, at the diftance of three or four days between each dofe. On the intermediate days, he was ordered the *oleum fuccini*, the fœtid gum, and the *oleum amygdalinum*. Of the firft he took 30 drops, of the gum 20 grains, and of the laft four ounces, in 24 hours. By thefe means, and thefe only, the convulfions foon ceafed; and he grew daily better and better, till at the end of a fortnight he was able to walk about his room, and in lefs than three weeks became in all refpects well, fome fmall weaknefs in the parts only excepted. The jaw was relieved firft, after that the fpine, and laft of all the legs. A pain and uneafinefs in the places affected, neither of which he had felt before, were the forerunners of his approaching amendment.

From all this it feems reafonable to conclude, either that there is no certain remedy for tetanus in all cafes, or that the medicines which prove effectual in one conftitution will fail in another. Thus, it is poffible, that in cafes where opium proves ineffectual, mercury may be a remedy; and, on the contrary, where mercury fails, opium may be effectual; and even where both are ineffectual, the antifpafmodics recommended by Dr Carter may be of ufe. It is therefore neceffary for phyficians to be extremely careful to obferve the effects of the firft dofes of their remedies: for if the fymptoms fhow not the leaft appearance of remiffion after a large dofe of opium, it is improbable that it can be cured by a repetition of the medicine; and as no time can be loft with fafety, it will then be proper to apply mercurial ointment, or whatever elfe may be judged proper.—In the Edinburgh Medical Commentaries we have an account of the cold bath being ufed as a remedy, by Dr Thomas Cochrane, at that time phyfician at Nevis, now at Edinburgh. The patient was an Eaft Indian boy, who had been gored by a cow, and afterwards expofed to a rainy damp air for fome hours. Dr Cochrane afcribes his cure to the cold bath, which was applied by dafhing the water upon his body. But as the patient at the fame time got laudanum, at firft in the quantity of 200 drops a-day, and afterwards in ftill larger dofes; and had befides his throat and fhoulders anointed with warm oil of turpentine, was bled, and had lenient glyfters and laxatives; it is by no means eafy to fay what fhare the cold bath had in his cure. Dr Cochrane, however, fays he has heard of Tetanus. fome cafes being treated fuccefsfully by cold water and the Peruvian bark in St Euftatia and St Kitt's, and in another letter mentions his having ufed the cold bath in other cafes of tetanus with fuccefs. But fince Dr Cochrane's publication, a more full and fatisfactory account of the benefit of this practice has been communicated in a paper publifhed by Dr Wright, in the fixth volume of the London Medical Obfervations. Dr Wright gives a particular account of fix cafes, in which the beft effects were obtained from dafhing cold water upon the patient; and he obferves, that fince he firft ufed this method of cure he never failed in one inftance to effect a recovery, and that in a fhorter time than by any other method hitherto propofed. This practice has on fome occafions been adopted by practitioners in Britain, although here the difeafe is a much lefs frequent occurrence. It has particularly been employed with fuccefs by Dr Currie of Liverpool; and we hope that ftill more extenfive practice will confirm the benefit to be derived from it, although not in every inftance, yet in many cafes of this affection.

Very lately a different mode of cure in this affection has been recommended by Dr Rufh, profeffor of medicine in Philadelphia, in a paper intitled Obfervations on the Caufe and Cure of Tetanus, publifhed in the fecond volume of the Tranfactions of the American Philofophical Society. Dr Rufh, viewing tetanus as being a difeafe occafioned by relaxation, thinks the medicines indicated to cure it are fuch only as are calculated to remove this relaxation, and to reftore tone to the fyftem. On this ground he recommends the liberal ufe of wine and the Peruvian bark; and tells us, that he has employed them with fuccefs in actual practice. When the difeafe arifes from a wound of any particular place, he recommends ftimulants to the part affected; fuch as dilatation of the wound, and filling it with oil of turpentine. How far this practice will be confirmed by more extenfive experience, we cannot take upon us to determine. We may only obferve, that a very contrary practice has been recommended as highly fuccefsful by fome practitioners in Spain, where tetanic affections are a very frequent occurrence in confequence of flight accidents. There gentle emollients are ftrongly recommended, particularly immerfing the wounded part in tepid oil for the fpace of an hour or fo at a time, and repeating this application at fhort intervals. By this mode many cafes, after very alarming appearances had taken place, are faid to have been completely and fpeedily removed. While the practice is very fimple, it appears at the fame time in many refpects very rational, and may perhaps be confidered as well deferving a trial in the firft inftance.

GENUS XLIX. TRISMUS. 280
The LOCKED JAW.

Trifmus, *Sauv.* gen. 117. *Lin.* 124. *Sag.* gen. 223. Capiftrum, *Vog.* 208.

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Sp. I. TRISMUS NASCENTIUM.
Locked Jaw in children under two months old.

Trifmus nafcentium, *Sauv.* fp. 1. *Heifter* Comp. Med. Pract. cap. xv. § 10. *Cleghorn* on the Difeafes of Minorca, Introd. p. 33. *Hofer* in Act. Helvet. tom. i. p. 65.

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This diſtemper is ſo cloſely connected with the tetanus, that it ought rather to be accounted a ſymptom of the tetanus than a primary diſeaſe. We have accordingly diſcuſſed it under TETANUS.

282 Sp. II. The TRISMUS from *Wounds or Cold.*

Triſmus traumaticus, *Sauv.* ſp. 2. *Lond. Med. Obſ.* Vol. I. art. 1. 7. Vol. II. 34. Vol. III. 31. Vol. IV. 7.
Angina ſpaſmodica, *Sauv.* ſp. 18. *Zwingeri* Act. Helvet. Tom. III. p. 319.
Convulſio a nervi punctura, *Sauv.* ſp. 2.
Triſmus catarrhalis, *Sauv.* ſp. 15. *Hillary's* Barbadoes, 221. *Lond. Med. Obſ.* Vol. IV. 7.

The internal remedies proper in all caſes of the locked jaw, from whatever cauſe it may proceed, have been already mentioned under TETANUS: the external treatment of wounded parts which may give occaſion to it belongs to the article SURGERY. But of this alſo we have offered ſome obſervations under the head of Tetanus; and, indeed, triſmus may be conſidered as being merely an incipient tetanus, or rather a ſlight degree of that diſeaſe.

283 GENUS L. CONVULSIO.
CONVULSIONS.

Convulſio, *Sauv.* gen. 128. *Lin.* 142. *Vog.* 191. *Sag.* gen. 235.
Convulſio univerſalis, *Sauv.* ſp. 11.
Hieranoſos, *Lin.* 144. *Vog.* 190.
Convulſio habitualis, *Sauv.* ſp. 12.
Convulſio intermittens, *Sauv.* ſp. 16.
Convulſio hemitotonos, *Sauv.* ſp. 15.
Convulſio abdominis, *Sauv.* ſp. 10.
Convulſio ab inanitione, *Sauv.* ſp. 1.
Convulſio ab onaniſmo, *Sauv.* ſp. 13.
Scelotyrbe feſtinans, *Sauv.* ſp. 2.

Deſcription. When convulſions attack only particular parts of the body, they are generally attended with ſome kind of paralyſis at the ſame time, by which means the affected parts are alternately convulſed and relaxed; a permanent convulſion, or unnatural contraction of particular muſcles, is called a *ſpaſm* or *cramp*. Theſe partial convulſions may attack almoſt any part of the body; and are not unfrequently ſymptomatic, in fevers, the cholera morbus, &c. The involuntary ſtartings of the tendons, the picking of the bed-clothes, &c. in acute diſeaſes, &c. are all of them convulſive diſorders. Convulſions, even when moſt generally extended, differ from epilepſy in not being attended with any mental affection or abolition of ſenſe, and not followed by the ſame torpid ſtate.

Cauſes. Convulſions, not only of particular parts, but alſo over the whole body, often take place from cauſes not very evident. Sometimes they ſeem to depend on a certain delicacy or irritability of the nervous ſyſtem, which is framed with ſuch exquiſite ſenſibility as to be ſtrongly affected by the ſlighteſt cauſes. Delicate women are often ſubject to hyſterical convulſions, and alſo hypochondriac people. Convulſions, however, often take their riſe from wounds, irritations of the ſtomach and inteſtines by worms, poiſons, violent cathartics and emetics, &c.; and very often they are ſymptomatic, as in dentition, the ſmall-pox, and many kinds of fevers. Convulſio.

Prognoſis. Except in ſome few caſes, convulſive diſorders are always to be dreaded; but leſs in young people than in ſuch as are advanced in life. Thoſe which attack girls under the age of puberty, will generally ceaſe on the appearance of the menſes; and boys have likewiſe a chance of being relieved as they advance in life: but in grown up people, unleſs the cauſe be very evident, a cure is hardly to be expected, eſpecially after the diſeaſe has been of long continuance.

Cure. The treatment is very much the ſame with that of epilepſy, afterwards to be conſidered: but a recovery is moſt frequently obtained by the removal of the exiſting cauſe.

GENUS LI. CHOREA. 284
ST VITUS'S DANCE.

Scelotyrbe, *Sauv.* gen. 136. *Sag.* 243.
Chorea, *Lin.* 139.
Scelotyrbe chorea Viti, *Sauv.* ſp. 1.
Chorea St Viti, *Sydenh.* Sched. Monit.

Deſcription. This diſeaſe ſhows itſelf firſt by a kind of lameneſs or inſtability of one of the legs, which the patients draw after them in a ridiculous manner: nor can they hold the arm of the ſame ſide ſtill for a moment; for if they lay it on their breaſt, or any other part of their body, it is immediately forced away by a convulſive motion. If they be deſirous of drinking, they uſe a number of odd geſticulations before they can bring the cup to their mouths, becauſe their arms are drawn this way and that by the convulſions which affect them.

Cauſes, &c. The general cauſe of St Vitus's dance is a debility of the ſyſtem; and hence we find it attacks only weakly boys, and more eſpecially girls, when under the age of puberty. But the particular cauſes determining the muſcles to be affected in ſuch and ſuch a manner are entirely unknown.

Prognoſis. As this diſorder ſcarce ever attacks any perſons but ſuch as are under the age of puberty, there is almoſt a certain proſpect of its being then cured, though generally the diſorder is eaſily removed before that time.

Cure. See EPILEPSY.

GENUS LII. RAPHANIA. 285

Raphania, *Lin.* 155. *Vog.* 143. *Lin.* Amœn. Acad. Vol. VI.
Convulſio raphania, *Sauv.* ſp. 7.
Eclampſia typhodes, *Sauv.* ſp. 1. *Sennert* de febr. l. iv. cap. 16. *Gregor. Horſt.* Oper. tom. II l. viii. obſ. 22. *Brunner* in Ephem. Germ. D. iii. A ii. obſ. 224. *Williſch.* ibid. cent. vii. obſ. 13. *Wepfer.* de Affect. Capitis, obſ. 120. *Breſlauer* Sammlung 1717, Julio, Septembri, & Decembr. Ibid. 1723, Januar. A. N. C. Vol. VII. obſ. 41. *Bruckmann.* Com. Norimb. 1743, p. 50.

Deſcription. According to Sauvages, this diſtemper begins with a laſſitude of the limbs, tranſient colds and ſhiverings, pain of the head, and anxieties of the præcordia. Then come on ſpaſmodic ſtartings of the fingers and feet; alſo of the tendons and muſcles, con-

Spasmi spicuous below the skin. The disease is attended with heat, fever, delirium, stupor, constriction of the breast, suffocating dyspnœa, loss of voice, horrid convulsions of the limbs, preceded by a formication, or sensation as of ants or other small insects creeping on the parts. In this state of the disease, the convulsive paroxysms are attended with most violent pains in the limbs, vomiting, or diarrhœa, with the passing of worms, thirst, and in young people an unnatural hunger. It continues from ten days to three months. About the eleventh or twentieth day, some are relieved by copious sweats, or purple exanthemata: while others fall into a tabes, with stupor, or stiffness of the joints.

Causes, &c. This disease is frequently epidemic in Suabia and other parts of Germany; where it is said to be produced by seeds of radishes, which are often mixed with rye in that country; and from this supposed cause the disease takes its name. It is also, however, a very common opinion, that this disease depends on the rye used in diet being of a bad quality, and particularly containing a large proportion of what is called *spurred rye*.

Cure. In this affection, also, the cure, as far as it has yet been discovered, is very much the same with that of epilepsy, the disease next to be considered.

286 GENUS LIII. EPILEPSIA.
FALLING-SICKNESS.

Epilepsia, *Sauv.* gen. 134. *Lin.* 143. *Vog.* 188. *Sag.* gen. 24. *Boerh.* 1071. *Hoffm.* III. 9. *Junck.* 54.
Eclampsia, *Sauv.* gen. 133. 180. *Sag.* gen. 240.

287 Sp. I. The CEREBRALIS, or *Epilepsy* depending on an affection of the *Brain*.

Epilepsia plethorica, *Sauv.* sp. 1.
Eclampsia plethorica, *Sauv.* sp. 7.
Epilepsia cachectica, *Sauv.* sp. 2.?

288 Sp. I. The SYMPATHICA, or *Sympathetic Epilepsy*, with a sensation of something rising from a certain part of the body towards the Head.

Epilepsia sympathica, *Sauv.* sp. 8.
Epilepsia pedisymptomatica, *Sauv.* sp. 6.

289 Sp. II. The OCCASIONALIS, or *Epilepsy* arising from various irritating Causes.

Epilepsia traumatica, *Sauv.* sp. 13.
Eclampsia traumatica; *Sauv.* sp. 9.
Epilepsia a dolore, *Sauv.* sp. 10.
Epilepsia rachialgica, *Sauv.* sp. 14.
Eclampsia a doloribus, *Sauv.* sp. 4.
a. Rachialgica.
b. Ab otalgia.
c. A dentitione.
Eclampsia parturientium, *Sauv.* sp. 3.
Eclampsia verminosa, *Sauv.* sp. 2.
Eclampsia ab atropa, *Sauv.* sp. 11.
Eclampsia ab œnanthe, *Sauv.* sp. 12.
Eclampsia a cicuta, *Sauv.* sp. 13.
Eclampsia a coriaria, *Sauv.* sp. 14.
Epilepsia exanthematica, *Sauv.* sp. 11.
Epilepsia cachectica, *Sauv.* sp. 2.
Epilepsia stomachica, *Sauv.* sp. 3.
Eclampsia a saburra, *Sauv.* sp. 5.
Epilepsia a pathemate, *Sauv.* sp. 7.
Eclampsia ab inanitione, *Sauv.* sp. 8.
Epilepsia neophytorum, *Sauv.* sp. 15.

Epilepsia. *Description.* The epilepsy often attacks suddenly and without giving any warning: but more frequently is preceded by a pain in the head, lassitude, some disturbance of the senses, unquiet sleep, unusual dread, dimness of sight, a noise in the ears, palpitation of the heart, coldness of the joints, and in some there is a sensation of formication, or a cold-air, &c. ascending from the lower extremities towards the head. In the fit, the persons fall suddenly to the ground (whence the name of the *falling-sickness*), frequently with a violent cry. The thumbs are shut up close in the palms of the hands, and are with difficulty taken out; the eyes are distorted, so that nothing but the whites are to be seen; all sensation is suspended, insomuch, that by no smell, noise, or otherwise, nor even by pinching the body, can they be brought to themselves; they froth at the mouth, with a hissing kind of noise; the tongue is frequently lacerated by the teeth, and there is a violent convulsive motion of the arms and legs. Sometimes, however, the limbs, instead of being agitated by convulsive motions, are all stiff, and the patients are as immoveable as a statue. In children the penis is erected; and in young men there is an emission of the semen, and the urine is often thrown out to a considerable distance. At length there is a remission of the symptoms, and the patients recover after a longer or shorter interval; when they complain of a pain, torpor, or heaviness of the head, with a lassitude of all the joints.

Causes, &c. The dissection of epileptic subjects has shown a variety of morbid appearances, which may be supposed to have contributed to the disease; such as, indurations in the brain or meninges; caries of the internal surface of the cranium; projections of the boney substance of the same, pressing upon the brain; collections of serum or purulent matter, and earthy concretions within the skull; besides many others which are recorded by Bonetus, Morgagni, and Lieutaud. But often the causes are impossible to be discovered; for even in those who have died of the disease, the brain and all other parts of the nervous system have been apparently found. The disease will attack strong as well as weak people; and in those who are subject to it, any considerable excess in drinking, a surfeit, violent passion, or venery, &c. will certainly bring on a fit. Some have epileptic paroxysms returning periodically after considerable intervals; and the disease has been thought to have some dependence on the phases of the moon.

Prognosis. If the epilepsy comes on before the time of puberty, there are some hopes of its going off at that time. But it is a bad sign when it attacks about the 21st year, and still worse if the fits grow more frequent; for then the animal-functions are often destroyed, as well as those of the mind, and the patient becomes stupid and foolish. Sometimes it will terminate in melancholy or madness, and sometimes in a mortal apoplexy or palsy. It has sometimes, however, been observed, that epilepsies have been removed by the appearance of cutaneous diseases, as the itch, small pox, measles, Spasmi measles, &c. While the disease is recent, therefore, we are not to despair of a cure; but if it be of long standing, or hereditary, there is very little reason to expect that it can be removed

Cure. From the symptoms occurring in epilepsy, which consist of involuntary convulsive motions, and an affection of the mental powers, there is reason to conclude, that the fit immediately depends on the induction of some peculiar action of the brain; but that convulsions may ensue from this cause, it would seem necessary that there should also occur a peculiar disposition to action in the moving fibres. On this ground then, we may suppose the cure to be chiefly expected on one of two principles; either by our being able to prevent the peculiar action of the brain, or to remove the disposition to action in the moving fibres. The first is chiefly to be accomplished by the removal of irritating causes, by preventing their influence from being propagated to the brain, when they are applied to remote parts; or by counteracting their influence, from inducing in the brain a state of action different from that to which they give rise. The second end is chiefly to be obtained by diminishing the mobility of the nervous energy, and by strengthening the tone of the moving fibres. It must, however, be allowed, that in all convulsive disorders, excepting those which are cured by nature about the time of puberty, the cure by artificial means is very difficult. Numberless specifics have been recommended, but all of them have failed of answering the expectation. When the cause can be discovered, that must be removed. In other cases, the cold bath, valerian root, castor, musk, opium, the fœtid gums, Peruvian bark, with the whole tribe of nervous and antispasmodic medicines, have been recommended: but none of these, or indeed any combination of them, have been found generally useful; though the slighter, or symptomatic cases, may often be removed by them.

Of late the *calx*, improperly called the *flowers*, of zinc, have obtained such reputation in convulsive disorders as to be received into the Edinburgh Pharmacopœia under the title of *zincum ustum*. They were proposed by Dr Gaubius as an antispasmodic, in his *Adversaria;* and their efficacy has since been confirmed by various observations. In an inaugural dissertation published by Dr Hart at Leyden, the medical virtues of the flowers of zinc are considered. He observes, that they have long been used externally, chiefly for inflammations of the eyes from acrid lymph. Glauber first proposed the internal use of them; and Gaubius discovered them to be the remedy of a celebrated empiric Luddemannus, which he styled his *luna fixata*. After this he exhibited them with success in convulsive and spasmodic diseases. Dr Hart supposes, that they act either as absorbents, or as possessing a specific virtue: but is a strong advocate for their efficacy, on whatever principles they may operate; and, in favour of his opinion, relates seven cases in which they proved successful. A girl of 17 years of age, was seized with a slight *chorea* from a fright; and when the disease had continued six days, she began to take the flowers of zinc, by which her disorder was removed in less than three weeks. Her cure required only 16 grains of the calx. In a few months the complaints returned, from the same cause; and were Epilepsia. removed by four grains of the medicine divided into ten doses.—A boy of about four years old, labouring under a real epilepsy, suspected to be hereditary, was cured by a grain of the flowers of zinc taken every day for some time.—A man 50 years old, thrown into convulsions from a violent passion, was cured by a grain of the calx taken every two hours. The disease had gone off upon venesection and the use of some other remedies; but returned again in two weeks, when it was finally removed by the zinc. The two last cases are related from Dr Gaubius, who affirms that he has used the flowers of zinc in cases of the chincough, hysteric hiccough, and spasmus cynicus; that they frequently did more than other medicines, but were by no means successful in every case. The other cures mentioned by Dr Hart are similar to those above-mentioned. But it does not appear that he ever saw a confirmed epilepsy cured by this medicine.

In the first volume of *Edinburgh Medical Commentaries*, we have an account by Mr Benjamin Bell, of a man afflicted with a confirmed epilepsy, who was considerably relieved by the flowers of zinc. He was about 35 years of age, and had been subject to the disease for 10 years. At first the paroxysms did not return oftener than once a month; but becoming gradually more frequent, they came at last to be in a manner continual, insomuch that he would have ten, eleven, or twelve attacks in a day, and very seldom had an interval of 24 hours. His memory and judgment were so much impaired, that he could scarce answer a question distinctly. He had used a great variety of medicines without any benefit. About three years before applying to Mr Bell, he had violent rheumatic pains in his limbs, which left such an extreme debility that he was never afterwards able to get out of bed without the assistance of two or three people.

On the 22d of October 1772, Mr Bell found him in the above mentioned condition, and prescribed as follows:

R. *Flor. Zinc.* gr. xxiv.

Ext. Gent. ℥i. M. f. mass. et divid. in pill. xxiv. cap. 1. m. & v.

He continued to take two pills a-day till the first of November, without any sensible benefit. The dose was then doubled, and continued till the 12th; when the fits, though equally violent, became less frequent. The medicine was gradually augmented to ten pills thrice a-day; and the consequence was, that his memory and understanding returned, the fits became much slighter and less frequently repeated, though the disease could not be radically subdued.

In a young man labouring under the epilepsy, in whom the fits were preceded by an *aura epileptica*, or sensation like air arising from the inside of the knee-joint, the disease was also relieved, but not cured.

Dr Percival relates some cases of epilepsy which seem to have been cured by the flowers of zinc; and in other cases, where the disease was not entirely removed by it, the spasms were nevertheless much mitigated. He did not observe that it promoted any evacuation; excepting that in some, upon being first taken, it occasioned a little sickness, which went off with a stool. He adds, that those apothecaries who do not prepare this

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this medicine themfelves, are in great danger of being impofed upon, as it is fometimes a mere corrofion of the zinc by an acid, and even imperfectly wafhed.

The good effects of calcined zinc as an antifpafmodic are alfo attefted by Dr Haygarth of Chefter and Dr White of York. The former gives a teft of their goodnefs which may be of ufe to thofe who do not prepare them, namely, that the true flowers of zinc, when ftrongly heated, become yellow, but reaffume their white colour on being allowed to cool. The latter gives a cafe of hieranofos, or ftrange convulfions of almoft all the mufcles of the body, cured by zinc, after a number of other remedies had failed. The patient, however, had been formerly much relieved by Ward's antimonial pill.

In Dr Home's clinical experiments and hiftories, alfo, calcined zinc is mentioned as having been found ferviceable upon trial in the Royal Infirmary of Edinburgh. Of the other principal remedies which have been recommended for the epilepfy and other convulfive diforders allied to it, we have the following account by the fame author.

1. *The cold-bath* was tried in one who had a convulfive diforder of one fide, but the fymptoms were rendered much worfe by it.

2. *Venefection.* Not to be depended on in convulfions.

3. *Electricity.* In two convulfive cafes was of no fervice.

4. *Epifpaftics.* Do not feem to be powerful antifpafmodics.

5. *Valerian.* In nine convulfive cafes, for which this remedy hath been reckoned almoft a fpecific, it not only made no cure, but could fcarcely be reckoned to do any good. Dr Home fuppofes that it acts as a bitter tonic, fomething like the *ferpentaria Virginiana.* Though much ufed at prefent, he tells us it has always appeared to him a weak, often a hurtful, medicine.

6. *Mufk.* Six convulfive patients treated with large dofes of this remedy, were neither cured nor in the leaft relieved.

7. *Caftor* feems to be unworthy of the confidence formerly put in it. It is indeed poffeffed of a fedative power, and therefore may be ufeful in fpafmodic feverifh cafes.

8. *Afafœtida* has confiderable antifpafmodic powers, but is not always fuccefsful. It heats and quickens the pulfe; and is therefore improper in cafes attended with inflammation. It difagrees with fome from a peculiarity of conftitution; exciting pain in the ftomach, and vomiting; but this can be known only after the exhibition of the medicine.

9. *Cortex Peruvianus.* Of feven fpafmodic cafes, fix were either cured or mitigated. An epilepfy of eight years ftanding was very much relieved by taking the bark for a month, and one of two years ftanding by taking it for ten days. But the medicine is of a heating nature, and therefore is not to be employed in cafes attended with inflammatory fymptoms.

10. *Peony root* was given to two epileptic patients without the leaft fuccefs.

11. *Vifcus quercinus*, or mifletoe, was given in the quantity of two fcruples five times a-day to an epileptic patient, without fuccefs.

12. *Extractum hyofciami* was given to an epileptic patient, to one afflicted with the hemitotonos, and to one who laboured under the hyfteric affection, without the leaft good effect.

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13. *Folia aurantiorum* were exhibited with the like bad fuccefs. Five drachms of the powdered leaves were taken at once without any fenfible effect.

14. *Cardamine pratenfis*, in three epileptic cafes, was not attended with any fuccefs.

15. *Opium* did no good.

16. *Cuprum ammoniacale* made no cure in four cafes of epilepfy in which it was tried.

That in many cafes all thefe remedies have been employed without fuccefs, is not to be denied: and indeed it may with confidence be afferted, that a great majority of cafes of epilepfy are incurable by any remedy that has yet been difcovered. At the fame time, as there is incontrovertible evidence that fome of them have fucceeded at leaft in certain cafes, the more powerful may always be confidered as deferving a fair trial. The cuprum ammoniacum, in particular, feems well intitled to the attention of practitioners; for though it be a medicine of great activity, yet under prudent adminiftration it may be employed even with very young fubjects without any hazard; and in feveral inveterate cafes, which had obftinately refifted other medicines, it has brought about a complete recovery.

Genus LIV. PALPITATIO. 290
Palpitation *of the* Heart.

Palpitatio, *Sauv.* gen. 130 *Lin.* 132. *Vog.* 213. *Sag.* 237. *Hoffm.* III. 83. *Junck.* 33.

The palpitation of the heart is fometimes fo violent, that it may be heard at a confiderable diftance. It may proceed from a bad conformation of the heart itfelf, or fome of the large veffels. It may alfo be occafioned by wounds or abfceffes in the heart; or it may proceed from polypous concretions or offifications of that vifcus, or from plethora, fear, or fpafmodic affections of the nervous fyftem. When it proceeds from difeafes of the heart or large veffels, it is abfolutely incurable. In fpafmodic cafes, the remedies above related may be ufed. If the patient be plethoric, bleeding will probably remove the diforder, at leaft for the prefent.

Genus LV. ASTHMA. 291

Afthma, *Sauv.* gen. 145. *Lin.* 161. *Vog.* 268. *Sag.* gen 282.
Afthma convulfivum, et fpafmodico-flatulentum, *Hoffm.* III. 94.
Afthma fpafticum, *Junck.* tab 51.

Sp. I. *Spontaneous* Asthma.

Afthma humidum, *Sauv* fp. 1. Flatulentum, *Floyer* on the Afthma, chap. i.
Afthma convulfivum, *Sauv.* fp. 2. *Willis* Pharm. rat. P. II. fect. i. cap. 12.
Afthma hyftericum, *Sauv.* fp. 3. *Floyer* on the Afthma, chap. i.
Afthma ftomachicum, *Sauv.* fp 8. *Floyer*, Scheme of the fpecies of Afthma. Periodic Afthma 6.
Orthopnœa fpafmodica, *Sauv.* fp. 3.
Orthopnœa hyfterica, *Sauv.* fp. 4.

Sp. II. The *Exanthematic* Asthma.

Afthma exanthematicum, *Sauv.* fp. 11.
Afthma cacheclicum, *Sauv.* fp. 13.

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Sp. III. The *Plethoric* Asthma.

Afthma plethoricum, *Sauv.* fp. 15.

The afthma is a chronic difeafe, which may continue to give very great diftrefs, at intervals, for a confiderable number of years. Sir John Floyer, when he wrote his celebrated treatife, had laboured under repeated paroxyfms for 30 years.

The common diftinction is into *humid* and *dry*; the former is accompanied with an expectoration of mucus or purulent matter, but the latter is not. In the genuine humoral afthma, the patients are obliged to lean forward; the infpiration is fhort and fpafmodic; and the expiration very flow.

Afthmatic perfons have generally fome warning of the attack, from a languor, lofs of appetite, oppreffion, and fwelling of the ftomach from flatulence, which precede the fit; but it is ufually in the middle of the night that the violent difficulty of breathing comes on.

The duration of the paroxyfm is uncertain, as it will fometimes terminate in three or four hours, while at other times it fhall continue for as many days; nay, it has been known to laft three weeks without intermiffion. While it fubfifts, the patient is in very great diftrefs, not being able to lie in bed, nor fcarcely to fpeak or expectorate, fo great is the difficulty of breathing; and yet, notwithftanding all this apparent interruption to the free paffage of the blood through the lungs, an inflammation here feldom or never fupervenes a fit of the afthma. As the paroxyfm wears off, and the breathing becomes free, there is more or lefs of an expectoration of mucus; and the urine, from being pale and limpid, becomes high-coloured, and lets fall a copious fediment.

In order to obtain relief in the fit, we muft fometimes bleed, unlefs extreme weaknefs or old age fhould forbid, and repeat it according to the degrees of ftrength and fulnefs: a purging clyfter, with a folution of afafœtida, muft be immediately injected; and if the violence of the fymptoms fhould not fpeedily abate, it will be proper to apply a bliftering plafter to the neck or breaft.

In the height of the paroxyfm, an emetic might be followed by dangerous fymptoms, as it would increafe the accumulation of blood in the veffels of the head; but vomiting will often prevent a fit of the afthma, efpecially if the ftomach fhould chance to be loaded with any fort of faburra. A very ftrong infufion of roafted coffee has been found to give eafe in an afthmatic paroxyfm.

Sir John Pringle fays it is the beft abater of the paroxyfms of the periodic afthma that he has feen. The coffee ought to be of the beft Mocco, newly burnt, and made very ftrong immediately after grinding it. He commonly ordered an ounce for one difh; which is to be repeated frefh after the interval of a quarter or half an hour; and which is to be taken without milk or fugar. The medicine in general is mentioned by Mufgrave in his treatife *de Arthritide anomala*; but he firft heard of it from a phyfician in Litchfield, who had been informed by the old people of that place, that Sir John Floyer, during the latter part of his life, kept free from, or at leaft lived eafy under, his afthma, from the ufe of very ftrong coffee. This difcovery, it feems, he made after the publication of his book upon that difeafe. Dr Percival fays he has frequently directed coffee in the afthma with great fuccefs.

Afthma.

In the intervals of the fits, perfons fubject to the afthma, efpecially the humid fpecies, fhould take emetics from time to time. An infufion of tobacco is an emetic that has been faid to be very ferviceable in fome afthmatic cafes; but its operation is both fo diftreffing and fo dangerous, that it will never probably be introduced into common ufe as an emetic; and fmoking or chewing the fame has been known to prevent the frequency and feverity of the paroxyfms. Afthmatic patients may alfo ufe the *lac ammoniaci*, with a due proportion of *oxymel fcilliticum* and *vinum antimoniale*, with a view to promote expectoration; or the gum ammoniac, and others of fimilar virtues, may be formed into pills, and combined with foap, as mentioned for the dyfpnœa pituitofa; or a mafs may be compofed of afafœtida and balfam of Tolu, with fyrup of garlic; and thefe pills may be wafhed down by a medicated wine, impregnated with fquills, horfe-radifh root, and muftard-feed; or a ftrong bitter infufion, with a little antimonial wine.

In fome cafes crude mercury will be found ferviceable; in others flowers of fulphur, made into an electuary with honey or fyrup of garlic; and if, notwithftanding the ufe of thefe things, a coftive habit fhould prevail, it will be neceffary, from time to time, to give a few grains of pills of aloes and myrrh, foap and aloes, or a mafs of equal parts of rhubarb, fcammony, and foap.

The *dry* or *fpafmodic afthma*, during the extreme violence of the fit, is beft relieved by opiates; and fometimes very large dofes are required. But in order to obtain permanent relief, nothing is found to anfwer better than ipecacuanha in fmall dofes. Three, five, eight, or ten grains, according to the ftrength and conftitution of the patient, given every other day, have been productive of the happieft effects; acting fometimes as an evacuant, pumping up the vifcid phlegm; at others, as an antifpafmodic or fedative. Iffues are generally recommended in both fpecies, and will often be found ufeful.

Changes of weather are ufually felt very fenfibly by afthmatic people, who in general cannot live with tolerable eafe in the atmofphere of large cities; though we fhall fometimes meet with patients who agree better with this air, which is fo replete with grofs effluvia of various kinds, than with the pureft that can be found in country fituations. And fome are found who breathe with the moft eafe in a crowded room, with a fire and candles.

A light diet of meats that are eafy of digeftion, and not flatulent, is requifite for afthmatic people; and the exercife of riding is indifpenfably neceffary.

When the afthma is found to depend on fome other difeafe, whether it be the gout or an intermittent fever, or when it proceeds from the ftriking in of fome cutaneous eruption, regard muft always be had to the primary difeafe: thus, in the *afthma arthriticum*, finapifms to the feet, or bliftering, will be abfolutely neceffary, in order, if poffible, to bring on a fit of the gout. And when the dregs of an ague give rife to an afthma, which is termed *febriculofum*, and invades at regular intervals, we muft have recourfe to the Peruvian

Spasmi vian bark. The *asthma exanthematicum* will require blisters or issues, to give vent to the acrid matters which were repelled from the surface of the body; and courses of sulphureous waters, goat's whey, and sweetening diet-drinks, or perhaps mercurial alteratives, in order to correct the sharpness of the juices.

292 GENUS LVI. DYSPNŒA.
Habitual DIFFICULTY of BREATHING.

Dyspnœa, *Sauv.* gen. 144. *Lin.* 160. *Vog.* 267. *Sag.* 251. *Junck.* 32.

293 Sp. I. The *Catarrhal* DYSPNOEA.

Asthma catarrhale, *Sauv.* sp. 16.
Asthma pneumonicum, *Willis* Pharm. rat. P. II. sect. i. cap. 12.
Asthma pituitosum, *Hoffm.* III. sect. ii. cap. 2. § 3.
Asthma pneumodes, *Sauv.* sp. 17.

This is readily known by the symptoms of pneumonia and catarrh attending it, and to the removal of these symptoms the care of the physician must be principally directed.

294 Sp. II. The *Dry* DYSPNOEA.

Dyspnœa a tuberculis, a hydatibus, &c. *Sauv.* sp. 2. 4. 5. 20.
Orthopnœa a lipomate, *Sauv.* sp. 18.

This is generally accompanied with a phthisis pulmonalis; but Sauvages mentions one species of phthisis to which the dry dyspnœa seems more particularly to belong. The patients fall away by degrees, and have a great difficulty of breathing, continual thirst, and little or no spitting. When opened after death, their lungs are found not to be ulcerated, but shrivelled and contracted as if they had been smoke-dried. Goldsmiths and chemists are said to be subject to this disease by reason of the vapours they draw in with their breath. Sauvages doth not mention any particular remedy. Shortness of breath arising from *tubercles*, as they are termed, or a scirrhous enlargement of the lymphatic glands which are dispersed through the lungs, is commonly found in scrofulous habits, and may be distinguished by the concomitancy of those external swellings and appearances which particularly mark the scrofula. This species of dyspnœa generally ends in a phthisis. Courses of goat's whey, and of sea-water, have been known to do service; but it must be confessed, that a perfect cure is seldom obtained. Issues are of use in these cases, as they appear to prevent the ill effects of an over-fulness, if it should happen at any time to supervene.

295 Sp. III. DYSPNOEA from *Changes* in the *Weather*. (*Sauv.* sp. 12.)

This seems to be a disease entirely spasmodic, and the antispasmodics already related are accordingly indicated.

296 Sp. IV. The DYSPNOEA from *Earthy Substances* formed in the *Lungs*.

Sauvages mentions this disease as much more common in brutes than in the human race: but Dr Cullen mentions his having seen some instances of it; and we have several accounts by different authors of calculous matters being coughed up by people labouring under a dyspnœa, and threatened with consumption. In three cases of this kind which fell under Dr Cullen's inspection, there was no appearance of earthy or stony concretions in any other part of the body. The calcareous matter was coughed up frequently with a little blood, sometimes with mucus only, and sometimes with pus. In one of these cases, an exquisite phthisis came on, and proved mortal: in the other two the symptoms of phthisis were never fully formed; and after some time, merely by a milk-diet and avoiding irritation, the patients entirely recovered. Asthma.

Sauvages also greatly recommends milk in these cases, and soap for dissolving the concretions. The reason why brutes are more subject to these pulmonary calculi than mankind, is, that they very seldom cough, and thus the stagnating mucus or lymph concretes into a kind of gypseous matter.

Sp. V. The *Watery* DYSPNOEA. 297

Dyspnœa pituitosa, *Sauv.* sp. 1.
Orthopnœa ab hydropneumonia, *Sauv.* sp. 12.

This may arise from too great a defluxion of mucus on the lungs, or from an effusion of serum, as is mentioned under the pneumonia. The treatment of the disease may be gathered from what has been already said under the heads of pneumonia, catarrh, empyema, &c.

Sp. VI. The DYSPNOEA from *Corpulency*. 298

Othopnœa a pinguedine, *Sauv.* sp. 6.

There have been many instances of suffocation and death occasioned by too great corpulency. These fatal effects, however, may be almost always avoided if the persons have resolution to persist in an active and very temperate course of life; avoiding animal-food, much sleep, and using a great deal of exercise. In the third volume of the Medical observations, however, there is an extraordinary instance of internal obesity which neither showed itself externally, nor could be removed by any medicines.

Other species of dyspnœa have been considered under PHTHISIS. It is frequently symptomatic of diseases of the heart and large vessels, or swellings of the abdomen, &c.

GENUS LVII. PERTUSSIS. 299
CHINCOUGH.

Pertussis *Sydenham*, Ed. Leid. p. 200. 311. 312. *Huxham* de aere, ad. ann. 1732.
Tussis convulsiva, sive ferina, *Hoffm.* III. 111.
Tussis ferina, *Sauv.* sp. 10. *Sag.* sp. 10.
Tussis convulsiva, *Sauv.* sp. 11. *Sag.* sp. 11.
Amphimerina tussiculosa, *Sauv.* sp. 13.

Description. This disease comes on at first like a common cold; but is from the beginning attended with a greater degree of dyspnœa than is common in catarrh; and there is a remarkable affection of the eyes, as if they were swelled, and a little pushed out of their sockets. By degrees the fits of coughing become longer and more violent, till at last they are plainly convulsive, so that for a considerable time the patient cannot respire, and when at last he recovers his breath, inspiration is performed with a shrill kind of noise like the

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the crowing of a cock. This kind of inspiration serves only as an introduction to another convulsive fit of coughing, which is in like manner followed by another inspiration of the same kind; and thus it continues for some time, very often till the patient vomit, which puts an end to the paroxysm at that time. These paroxysms are attended with a violent determination of the blood towards the head, so that the vessels become extremely turgid, and blood not unfrequently flows from the mouth and nose. The disease is tedious, and often continues for many months. It is not commonly attended with fever.

Causes, &c. The chincough is an infectious disorder, and very often epidemic: but the nature of the contagion is not understood; at least it is no farther understood than that of small-pox, measles, or similar epidemics. We well know that it is from a peculiar and specific contagion alone that this disease, as well as the others above-mentioned, can arise. But with regard to the nature of any of them, we are totally in the dark. It generally attacks children, or adults of a lax habit, making its attack frequently in the spring or autumn; at the same time, when this contagion is introduced into any town, village, or neighbourhood, it will rage epidemically at any season. Those alone are affected with this disease who have never before been subjected to it. For in this affection, as well as in small-pox, having had the disease once, gives defence against future contagion. Every individual, however, does not seem to be equally readily affected with this contagion; like other contagious diseases occurring only once in a lifetime, it may naturally be expected to be more frequent among children than at any other period of life. But many, though frequently exposed to contagion, are yet not affected with the disease: and those children who live upon unwholesome watery food, or breathe unwholesome air, are most liable to its attacks, and suffer most from them. In general it has been concluded, that whatever weakens the solids, or tends to bring on a dissolution of the fluids, predisposes to this disease.

Prognosis. The chincough is not very often fatal. During one epidemic, however, it is often observed to be much more dangerous and more severe than during another. This is also remarked with regard even to particular periods of the same epidemic; and it is also observed, that on certain families this disease is much more severe than on others. Its danger, however, is still more connected with the period of life at which it occurs. In children under two years of age it is most dangerous; and kills them by producing convulsions, suffocation, inflammation and suppuration of the brain or in the lungs, ruptures, and incurvation of the spine. In pregnant women it will produce abortion; and in adults inflammations of the lungs, and all the consequences of pneumonia, more frequently than in children. From a long continuance of the disease patients will become asthmatic, ricketty, and scrofulous. It is generally reckoned a good sign when a fit terminates by vomiting; for in this disease there seems to be a great increase of the secretion of mucus, and the vomiting affords great relief.

Cure. Pertussis is one of those diseases which after the contagion has exerted its influence can be terminated only by running a certain course: but it is much less limited in its course than small-pox and measles, and often it runs on to a very great length, or at least it is very difficult to distinguish certain sequelæ of this disease from the disease itself. And when it exists in the former of these states, it admits of an artificial termination. In the treatment of this affection, therefore, the objects at which a practitioner chiefly aims, are, in the first place, the obviating urgent symptoms, and forwarding the natural termination of the disease; and secondly, the inducing an artificial termination. With these intentions various practices are employed on different occasions. The most approved remedies are vomits, purges, bleeding, and the attenuating pectorals; for the other kinds generally do hurt: but large evacuations of any kind are pernicious. In the Medical Observations, Vol. III. Dr Morris recommends castor and the bark; but in cases attended with any degree of inflammation, the latter must certainly do hurt, and the former will generally be insignificant. Dr Butter, in a dissertation expressly on the subject, relates 20 cases of it cured by the extract of hemlock. He directs half a grain a-day for a child under six months old; one grain for a child from six months to two years; afterwards allowing half a grain for every year of the patient's age till he be 20: beyond that period, he directs ten grains to be given for the first day's consumption, gradually increasing the dose according to the effect. If the patient have not two stools a-day, he advises magnesia or the *lixivia vitriolata sulphurea* to be added to the hemlock mixture. By this method he says the peculiar symptoms of the disease are removed in the space of a week; nothing but a slight cough remaining. The use of hemlock, however, has by no means become universal in consequence of this publication, nor indeed has this remedy been found equally successful with others who have given it a fair trial. The remedy most to be depended upon in this disease is change of air. The patient, as soon as the disease is fully formed, ought to be removed to some other part of the country: but there is no occasion for going to a distant place; a mile or two, or frequently a smaller distance, will be sufficient; and in this new habitation, the frequency of the cough is almost instantly diminished to a most surprising degree. After remaining there for some time, however, the cough will often be observed to become again more frequent, and the other symptoms increased. In this case, another change of air, or even a return to the former habitation, becomes necessary. Manifest benefit has even been derived by changing a patient from one room of a house to another. But although change of air has thus been advantageous, it must also be remarked, that when it has been had recourse to at very early periods it has often done mischief, particularly by aggravating the febrile and inflammatory symptoms. If the disease be attended with fever, bleeding and other antiphlogistic remedies are proper. Dr Buchan recommends an ointment made of equal parts of garlic and hog's lard applied to the soles of the feet; but if it have any effect, it is probably merely as an *emplastrum calidum*. It ought to be put on a rag and applied like a plaster. Opiates may sometimes be

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300 GENUS LVIII. PYROSIS.
The HEART-BURN.

Pyrosis, *Sauv.* gen. 200. *Sag.* 158.
Soda, *Lin.* 47. *Vog.* 154.
Scotis, the WATER-BRASH.
Pyrosis Suecica, *Sauv.* sp. 4.
Cardialgia sputatoria, *Sauv.* sp. 5.

This disease, whether considered as primary or symptomatic, has already been fully treated under DYSPEPSIA.

301 GENUS LIX. COLICA.
The COLIC.

Colica, *Sauv.* gen. 204. *Lin.* 50. *Vog.* 160. *Sag.* 162. *Junck* 106.
Colica spasmodica et flatulenta, *Hoffm.* II. 284.
Rachialgia, *Sauv.* gen. 211. *Sag.* 168.
Ileus, *Sauv.* gen. 252. *Vog.* 162. *Sag.* gen. 187.
Iliaca, *Lin.* 185.
Dolor et spasmus iliacus, *Hoffm.* II. 263.
Passio iliaca, *Junck.* 107.

302 Sp. I. *The Spasmodic Colic.*

Colica flatulenta, pituitosa, &c. *Sauv.* sp. 1. 2. 5. 6. 7. Ileus physodes, volvulus, inflammatorius, &c. *Ejusd.* sp. 1. 3. 5. 7. 8. 9.

Description. The colic is chiefly known by a violent pain in the abdomen, commonly about the umbilical region. The pain resembles various kinds of sensations, as of burning, twisting, boring, a ligature drawn very tight, &c. The belly is generally costive, though sometimes there is a violent evacuation of bilious matters upwards and downwards. In these cases the disease is sometimes accompanied from the beginning with a weak and intermitting pulse, cold sweats, and fainting. In some the disease comes on gradually, beginning with an habitual costiveness; and if purgatives be taken, they do not operate. The pain comes on generally after a meal, and soon occasions nausea and vomiting. Sometimes the disease is attended with pyrexia, violent thirst, and a full pulse; the vomiting becomes more violent, and excrementitious matters are thrown up with the most exquisite pain and tension of the abdomen; an hickup comes on, which continues obstinately; till at last a cessation of pain and fetid breath indicate a mortification of the intestines and approaching death. Sometimes the peristaltic motion of the intestines is so totally inverted, that all their contents are evacuated by the mouth, and even clysters will be vomited; which constitutes that disease commonly called the *iliac passion.*

Colica. *Causes*, &c. Colics may arise from any sudden check given to perspiration, as by violent cold applied to any part of the body, especially to the lower extremities and abdomen. Very frequently they are occasioned by austere, acid, or indigestible aliments taken into the stomach. By any of these, a violent colic, or indeed an iliac passion, may be occasioned; for Dr Cullen justly observes, that this last, though commonly accounted a different species of disease, differs from a colic in no other way than in being in every respect in a much higher degree. In those who have died of this disease and been dissected, the intestines have sometimes been found twisted; but more commonly there hath been an *intrasusception* of the intestine, that is, one part of the gut seems to have entered within the other. In the Edinburgh Medical Essays, Vol. III. we have a dissertation on the use of the warm bath in the bilious colic, in which the author derives the disorder from a spasmodic constriction of the intestine occasioned by the acrimony of the bile. By this, he says, the intestine is not only contracted into an unusual narrowness, but coats of it have been found, upon dissection, so closely joined, that no passage could be made downwards more than if they had been strongly tied by a ligature. The formation of the *intrasusceptio* he explains by quoting a passage from Peyerus, who made the following experiment on a frog. Having irritated the intestine of the animal in several different places, he observed it to contract at those places most violently, and to protrude its contents upwards and downwards wherever the relaxed state of the part would permit; by which means the contents were heaped together in different parts. Hence some parts of the intestine being dilated much more than enough, by reason of the great quantity of matter thrown into them, formed a kind of sack which readily received the constricted part into it. If this happen in the human body, there is the greatest danger of a mortification; because the part which is constricted, and at any rate disposed to inflammation, has that disposition very much increased by its confinement within the other, and by the pressure of the contents of the alimentary canal from the stomach downwards upon it. An iliac passion may also arise from the strangulation of part of the intestine in a hernia; and even a very small portion of it thus strangulated may occasion a fatal disease. In the Medical Observations, Vol. IV. however, we have an account of an iliac passion arising from a very different cause, which could neither have been suspected nor cured by any other way than the operation of *gastrotomy*, or opening the abdomen of the patient, in order to remove the cause of the disorder. The patient, a woman of about 20 years of age, died after suffering extreme torture for six days. The body being opened, some quantity of a dirty coloured fluid was found in the cavity of the abdomen. The jejunum and ileum were greatly distended with air. A portion of the omentum adhered to the mesentery, near that part where the ileum terminates in the cæcum. From this adhesion, which was close to the spine, there ran a ligamentous cord or process about two inches and a half long, unequally thick, in some places not thicker than a packthread; which by its other extremity adhered to the coats of the ileum, about two inches

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Prognosis. The colic is never to be reckoned void of danger, as it may unexpectedly terminate in an inflammation and gangrene of the intestines. Those species of it which are attended with purging must be considered as much less dangerous than those in which the vomiting is very violent. The iliac passion, or that attended with the vomiting of feces, is always to be accounted highly dangerous; but if the passage through the intestines be free, even though their peristaltic motion should be inverted, and clysters evacuated by the mouth, there is much more hope of a cure, than when the belly is obstinately costive, and there is some fixed obstruction which seems to bid defiance to all remedies.

Cure. In the cure of the spasmodic colic, the recovery must ultimately depend on producing a resolution of the spasmodic affection. In order to accomplish this, it is in general necessary to evacuate the contents of the intestines, and to remove morbid irritability existing in that part of the system. But in order to preserve the life of the patient from the most imminent hazard, it is still more necessary to prevent and remove those inflammatory affections which often occur in this disease. As the chief danger in colics arises from an inflammation and consequent mortification of the intestines, it is essentially necessary, in the first place, to diminish the tendency to a pyrexia, if there should happen to be any. This is accomplished by bleeding, emollient injections, warm bathing, and cooling medicines taken inwardly. Dr Porter, in the essay abovementioned, strongly recommends the warm bath in those colics attended with violent evacuations of bile. He supposes it to do service by relaxing the constriction of the intestines, and thus preventing or removing the introsusceptio. In the mean time opiates may be given to ease the pain, while every method is tried, by cathartics and glysters of various kinds, to procure a stool. In obstinate cases, where stimulating cathartics have proved ineffectual, the milder kinds, such as manna, senna, oleum ricini, &c. will succeed; but where every thing of this kind fails, recourse must be had to some of the more extraordinary methods. Some have recommended the swallowing of leaden bullets, on a supposition that by their weight they would force through the obstruction into the gut; but these seem much more likely to create than to remove an obstruction. It is impossible they can act by their gravity, because the intestines do not lie in a straight line from the pylorus to the anus; and though this were actually the case, we cannot suppose that the weight of a leaden bullet could prove very efficacious in removing either a spasmodic constriction or an obstruction from any other cause. But when we consider, not only that the intestines consist of a great multitude of folds, but that their peristaltic motion (by which only the contents are forced through them) is inverted, the futility of this remedy must be evident. It might rather be supposed to aggravate the disease; as the lead, by its pressure, would tend to fix the introsusception more firmly, or perhaps push it still further on. The same thing may be said of quicksilver: not to mention the pernicious consequences to be apprehended from swallowing large quantities of this mineral, even if it should prove efficacious in relieving the patient for the present. There are, however, some late cases on record, particularly one by Mr William Perry, published in the sixteenth volume of the Edinburgh Medical Commentaries, in which the hydrargyrus, swallowed in great quantities, was attended with the happiest effects, after every other remedy had been tried in vain. Another method has been proposed, in the Medical Essays, for relieving the miserable patients in this disorder, which in many cases has been known to do service. The patient is to be taken out of bed, and made to walk about on the cold floor of a damp apartment. At the same time, porringers of cold water are to be dashed on his feet, legs, and thighs; and this must be continued for an hour or longer, if a stool be not procured before that time, though this will generally be the case much sooner. The exercise does not at all impair the patient's strength, but rather adds to it; and some very remarkable instances are adduced in the 6th volume of the Medical Essays, where this proved effectual after all other medicines had failed. In one person the disease had come on with an habitual costiveness, and he had been for a week tormented with the most violent pain and vomiting, which could be stopped neither by anodynes nor any other medicines, the sharpest clysters being returned unaltered, and all kinds of purgatives thrown up soon after they were swallowed; but by the abovementioned method, a stool was procured in 35 minutes, and the patient recovered. In some others the costiveness had continued for a much longer time.—Other remedies are, the blowing air into the intestines by means of a bellows, and the injecting clysters of the smoke of tobacco. But neither of these seem very capable of removing the disease. They can affect only the parts below the obstruction; while, to cure the disease, it is necessary that the obstructed parts themselves should be reached by the medicine, and therefore we have not many well-attested instances of their success. In some obstinate cases, however, benefit has certainly been derived from tobacco-smoke injections, and likewise from injections of tepid water to the extent of several pounds. For putting in practice these modes of cure, a particular apparatus have been contrived; and in cases even apparently desperate, neither should be neglected. The cold water gives a general and very considerable shock to the system, checks the perspiration, and thus drives the humours inward upon the intestines, by which they receive a much more effectual stimulus than can be supposed to arise from any kind of clyster. But when all methods have failed, the only chance the patient can have for life is by a manual operation.

In those colics which are attended with faintings, Colica.

Spafmi &c. from the beginning, and which generally attack hyfteric women and other debilitated perfons, all kinds of evacuations are pernicious; and the cure is to be attempted by anodynes and cordials, which will feldom fail of fuccefs. Even there alfo, however, it is neceffary that the belly fhould be moved; and for this purpofe injections, containing a folution of afafœtida, which operate powerfully as antifpafmodics, are preferable to moft other modes of cure.

303 Sp. II. Colica Pictonum. *The Colic of Poictou.*

Rachialgia Pictonum, *Sauv.* fp. 1.
Rachialgia metallica, *Sauv.* fp. 3.
Colica Pictonum *Citefii et fuccedentium auctorum.*

Another caufe to which violent colics are frequently to be afcribed, and which often gives occafion to them where it is very little fufpected, is lead, or fome folution or fume of it, received into the body. To this caufe is evidently owing the colics to which plumbers, lead-miners, and fmelters of lead, are fubject. To the fame caufe, though not fo apparent at firft fight, are we to afcribe the Devonfhire colic, where lead is received into the body diffolved in cyder, the common drink of the inhabitants of that country. This has been proved by experiment; for lead has been extracted from cyder in quantity fufficient to produce pernicious effects on the human body. The colic of Poictou, and what is called the *dry belly-ache* in the Weft Indies, are of the fame nature; for which reafon we give the following general defcription of the fymptoms of all thefe difeafes.

The patient is generally firft feized with an acute pain at the pit of the ftomach, which extends itfelf down with griping pains to the bowels. Soon after there is a diftenfion, as with wind; and frequent reachings to vomit, without bringing up any thing but fmall quantities of bile and phlegm. An obftinate coftivenefs follows, yet fometimes attended with a tenefmus, and the bowels feem to the patient as if they were drawn up towards the back; at other times they are drawn into hard lumps, or hard rolls, which are plainly perceptible to the hand on the belly, by ftrong convulfive fpafms. Sometimes the coats of the inteftines feem to be drawn up from the anus and down from the pylorus towards the navel. When a ftool is procured by artificial means, as clyfters, &c. the feces appear in little hard knots like fheep's dung, called *fcybalæ*, and are in fmall quantity. There is, however, ufually an obftinate coftivenefs; the urine is difcharged in fmall quantity, frequently with pain and much difficulty. The pulfe is generally low, though fometimes a little quickened by the violence of the pain; but inflammatory fymptoms very feldom occur. The extremities are often cold, and fometimes the violence of the pain caufes cold clammy fweats and fainting. The mind is generally much affected, and the fpirits are funk. The difeafe is often tedious, efpecially if improperly treated, infomuch that the patients will continue in this miferable ftate for twenty or thirty days fucceffively; nay, inftances have been known of its continuing for fix months. In this cafe the pains at laft become almoft intolerable: the patient's breath acquires a ftrong fetid fmell like excrements, from a retention of the feces, and an abforption of the putrid effluvia from them by the lacteals. Colica. At laft, when the pain in the bowels begins to abate, a pain comes on in the fhoulder-joints and adjoining mufcles, with an unufual fenfation and tingling along the fpinal marrow. This foon extends itfelf from thence to the nerves of the arms and legs, which become weak; and that weaknefs increafes till the extreme parts become paralytic, with a total lofs of motion, though a benumbed fenfation often remains. Sometimes, by a fudden metaftafis, the brain becomes affected, a ftupor and delirium come on, and the nervous fyftem is irritated to fuch a degree as to produce general convulfions, which are frequently followed by death. At other times, the periftaltic motion of the inteftines is inverted, and a true iliac paffion is produced, which alfo proves fatal in a fhort time. Sometimes the paralytic affection of the extremities goes off, and the pain of the bowels returns with its former violence; and on the ceffation of the pain in the inteftines, the extremities again become paralytic and thus the pain and palfy will alternate for a very long time.

Cure. Various methods have been attempted for removing this terrible difeafe. The obftinate coftivenefs which attends it, made phyficians at firft exhibit very ftrong purgatives and ftimulating clyfters. But thefe medicines, by increafing the convulfive fpafms of the inteftines, were found to be pernicious. Balfam of Peru, by its warm aromatic power, was found to fucceed much better; and Dr Sydenham accordingly prefcribed it in the quantity of 40 drops twice or thrice a day taken on fugar. This, with gentle purgatives, opiates, and fome drops of the hotter effential oils, continued to be the medicine commonly employed in this difeafe, till a fpecific was publifhed by Dr Lionel Chalmers of South Carolina. This receipt was purchafed by Dr Chalmers from a family where it had long been kept a fecret. The only unufual medicine in this receipt, and on which the efficacy of it chiefly if not wholly depends, is vitriolated copper. This muft be diffolved in water, in the quantity of one grain to an ounce, and the dofe of the folution is a wine-glafsful given fafting for nine fucceffive mornings. For the firft four or five days this medicine difcharges much æruginous bile both ways; but the excretions of this humour leffen by degrees; and before the courfe be ended, it has little other effect than to caufe fome degree of fqueamifhnefs, or promote a few bilious ftools, or perhaps may not move the patient at all. At the time of ufing this medicine the patients fhould live upon broth made of lean meat, gruel, or panada: but about the feventh or eighth day, they may be allowed bread and boiled chicken. Here the copper feems to do fervice by its tonic power; and for the fame reafon, alum, recommended by Dr Percival, moft probably cures the difeafe. He fays he has found this very efficacious in obftinate affections of the bowels, and that it generally proves a cure in the flighter cafes of the colica pictonum. It was given to the quantity of fifteen grains every fourth, fifth, or fixth hour; and the third dofe feldom failed to mitigate the pain, and fometimes entirely removed it. Among purgative medicines, the *oleum Ricini* is found to be the moft efficacious.

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304 Sp. III. The Colic from *Costiveness*.

Colica stercorea, *Sauv.* sp. 3.
Ileus a fæcibus induratis, *Sauv.* sp. 2.

For the treatment of this species, see above.

Sp. IV. The *Accidental Colic*.

Colica Japonica,—accidentalis,—lactentium,—a veneno, *Sauv.* sp. 10. 14. 18. 20.
Cholera sicca auriginosa a fungis venenatis, *ejusd.* sp. 2.

When colics arise from acrid poisonous matter taken into the stomach, the only cure is either to evacuate the poison itself by vomiting, or to swallow some other substance which may decompound it, and thus render it inactive. The most common and dangerous substances of this kind are corrosive mercury and arsenic. The former is easily decompounded by alkaline salts; and therefore a solution of lixivial salt, if swallowed before the poison has time to induce a mortification of the bowels, will prove a certain cure. Much more uncertain, however, is the case when arsenic is swallowed, because there is no certain and speedy solvent of that substance yet known. Milk has been recommended as efficacious; and lately a solution of *hepar sulphuris*. The latter may possibly do service; as arsenic unites readily with sulphur, and has its pernicious qualities more obtunded by that than by any other known substance: but indeed, even the solvent powers of this medicine are so weak, that its effects as well as those of others must be very uncertain.

Some kinds of fungi, when swallowed, are apt to produce colics attended with stupor, delirium, and convulsions; and the same sometimes happens from eating a large quantity of the shell-fish known by the name of muscles (the Mytulus). Some of the fungi, doubtless, may have an inherent poisonous quality; but generally they as well as the muscles act on a different principle. Their pernicious effects happen most commonly when they are taken on an empty stomach; and are then supposed to be occasioned by their adhering so close to its coats, that it cannot exert its powers, and the whole system is thrown into the utmost disorder. The malady may therefore be very easily prevented; but when once it has taken place, it cannot be removed till either a vomiting be excited, or the stomach has recovered itself in such a manner as to throw off the adhering matter.

305 Sp. V. Colic of *New-born Infants* from a *Retention* of the *Meconium*. (*Sauv.* sp. 19.)

This disorder would be prevented were children allowed immediately to suck their mothers, whose milk at first is purgative. But as this is not commonly done, the child is frequently troubled with colics. These, however, may be removed by a few grains of ipecacuanha, or a drop or two of antimonial wine. By these means the stomach is cleansed by vomiting, and the belly is generally loosened; but if this last effect does not happen, some gentle purge will be necessary.

306 Sp. VI. Colic from a *Callosity* of the *Colon*.

It is in a manner impossible to discover this distemper before the patient's death; and though it should, it does not admit of a cure.

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Sp. VII. The Colic from *Intestinal Calculi*. (*Sauv.* sp. 10. 15.) 307

When certain indigestible bodies, such as cherry-stones, plum-stones, small pieces of bones, &c. are swallowed, they frequently prove the basis of calculi, formed by an accretion of some kind of earthy matter; and being detained in some of the flexures of the intestines, often occasion very violent colics. These calculi do not discover themselves by any peculiar symptoms, nor do they admit of any particular method of cure. In the Medical Essays we have an instance of colics for six years, occasioned by calculi of this kind. The concretions were at last passed by stool; and their passage was procured by causing the patient drink a large quantity of warm water, with a view to promote the evacuation of bile, a redundancy of which was supposed to be the cause of her disorder.

Genus LX. CHOLERA, the Cholera Morbus. 308

Cholera, *Sauv.* 253. *Lin.* 186. *Vog.* 110. *Sag.* 188. *Hoffm.* II. 165.
Diarrhœa cholerica, *Junck.* 112.

Sp. I. The *Spontaneous Cholera*, coming on without any manifest cause. 309

Cholera spontanea, *Sauv.* sp. 1. *Sydenh.* sect. iv. cap. 2.
Cholera Indica, *Sauv.* sp. 7.

Sp. II. The *Accidental Cholera*, from acrid matters taken inwardly. 310

Cholera crapulosa, *Sauv.* sp. 11.
Cholera a venenis, *Sauv.* sp. 4. 5.

The cholera shows itself by excessive vomiting and purging of bilious matters, with violent pain, inflation and distension of the belly. Sometimes the patients fall into universal convulsions; and sometimes they are affected with violent spasms in particular parts of the body. There is a great thirst, a small and unequal pulse, cold sweats, fainting, coldness of the extremities, and hiccough; and death frequently ensues in 24 hours.

In this disease, as a larger quantity of bile is deposited in the alimentary canal, particularly in the stomach, the first object is to counteract its influence, and to promote an easy discharge of it. It is next necessary to restrain that increased secretion of bile, by which a fresh deposition in the alimentary canal would otherwise be soon produced. And, in the last place, measures must often be employed to restore a sound condition to the alimentary canal, which is frequently much weakened by the violence of the disease.

On these grounds, the cure of this distemper is effected by giving the patient a large quantity of warm water, or very weak broth, in order to cleanse the stomach of the irritating matter which occasions the disease, and injecting the same by way of clyster, till the pains begin to abate a little. After this, a large dose of laudanum is to be given in some convenient vehicle.

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vehicle, and repeated as there is occasion. But if the vomiting and purging have continued for a long time before the physician be called, immediate recourse must be had to the laudanum, because the patient will be too much exhausted to bear any further evacuations. Sometimes the propensity to vomit is so strong, that nothing will be retained, and the laudanum itself thrown up as soon as swallowed. To settle the stomach in these cases, Dr Douglas, in the Medical Essays, recommends a decoction of oat-bread toasted as brown as coffee; and the decoction itself ought to be of the colour of weak coffee. He says he does not remember that this decoction was ever vomited by any of his patients. An infusion of mint-leaves or good simple mint-water is also said to be very efficacious in the same case.

The tincture of opium is sometimes retained when given in conjunction with a portion of the vitriolic acid properly diluted. But when it cannot be retained in a fluid form by the aid of any addition, it will sometimes sit upon the stomach when taken in a solid state.

After the violence of the disease is overcome, the alimentary canal, and the stomach in particular, requires to be braced and strengthened. With this view recourse is often had with advantage to different vegetable bitters, particularly to the use of the colombo root; which, while it strengthens the stomach, is also observed to have a remarkable tendency in allaying a disposition to vomiting, which often remains for a considerable time after the cholera may be said to be overcome.

311 Genus LXI. DIARRHOEA.

Looseness.

Diarrhœa, *Sauv.* gen. 253. *Lin.* 187. *Vog.* 105. *Sag.* gen. 189. *Junck.* 112.
Hepatirrhœa, *Sauv.* gen. 246.
Cholerica, *Lin.* 190.
Cœliaca, *Sauv.* gen. 255. *Lin.* 189. *Vog.* 109. *Sag.* gen. 199.
Lienteria, *Sauv.* gen. 256. *Lin.* 188. *Sag.* gen. 191. *Vog.* 108.
Pituitaria, & leucorrhois, *Vog.* 111. 112.

312 Sp. I. The *Feculent Diarrhoea.*

Diarrhœa stercorosa & vulgaris, *Sauv.* sp. 1. 2.

This is occasioned by the too great quantity of matter thrown into the alimentary canal; and what is discharged has not the appearance of excrements, but is much whiter, and of a thinner consistence. Voracious people who do not sufficiently chew their food, gormandizers, and even those who stammer in their speech, are said to be liable to this disease. In slighter cases it is removed without any medicine, or by a dose of rhubarb; but where the matters have acquired a putrid taint, the disorder may be exceedingly protracted and become dangerous. In this case lenient and antiseptic purgatives are to be made use of, after which the cure is to be completed by astringents.

313 Sp. II. The *Bilious Diarrhoea.*

(*Sauv.* sp. 8.)

This distemper shows itself by copious stools of a very yellow colour, attended with gripes and heat of the bowels, thirst, bitterness, and dryness of the mouth, yellowness of the tongue, and frequently follows an intermitting or bilious fever. When the fever is gone, the diarrhœa is to be removed by acidulated and cooling drinks, with small doses of nitre.

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Sp. III. The *Mucous Diarrhoea.* 314

Diarrhœa lactentium, *Sauv.* sp. 19.
Dysenteria Parisiaca, *Sauv.* sp. 3.
Diarrhœa ab hypercatharsi, *Sauv.* sp. 16.
Dysenteria a catharticis, *Sauv.* sp. 12.
Pituitaria, *Vog.* 111.
Leucorrhois, *Vog.* 112.
Diarrhœa pituitosa, *Sauv.* sp. 4.
Cœliaca mucosa, *Sauv.* sp. 3.
Diarrhœa serosa, *Sauv.* sp. 10.
a. Diarrhœa urinosa.

This kind of diarrhœa, besides the matters usually excreted, is attended with a copious dejection of the mucus of the intestines with great pain; while the patient daily pines away, but without any fever.—Persons of all ages are liable to it, and it comes on usually in the winter-time; but is so obstinate, that it will sometimes continue for years. In obstinate loosenesses of this kind, vomits frequently repeated are of the greatest service. It is also very beneficial to keep the body warm, and rub the belly with stimulating ointments; at the same time that astringent clysters, rhubarb, and stomachic medicines, are to be exhibited. Starch clysters are very often efficacious.—Some kinds of loosenefs are contagious; and Sir John Pringle mentions a soldier who laboured under an obstinate diarrhœa, who infected all those that used the same privy with himself. In the looseness which frequently followed a dysentery, the same author tells us that he began the cure with giving a vomit of ipecacuanha, after which he put the patients on a course of astringents. He used a mixture of three drachms of extract of logwood, dissolved in an ounce and a half of spirit of cinnamon, to which was added seven ounces of common water, and two drachms of tincture of catechu. Of this the patient took two spoonfuls once in four or five hours, and sometimes also an opiate at bed-time. He recommends the same medicine in obstinate diarrhœas of all kinds. A decoction of simarauba bark was also found effectual, when the dysenteric symptoms had gone off. Dr Huck, who used this article in North-America, also recommends it in diarrhœas. Two or three ounces of the simarauba are to be boiled in a pound and a half of water to a pound, and the whole quantity taken throughout the day. He began with the weakest decoction; and, when the stomach of the patient could easily bear it, he then ordered the strongest: but at the same time he acknowledges, that, unless the sick found themselves sensibly better within three days from the time they began the medicine, they seldom afterwards received any benefit from it. But when all astringents have failed, Sir John Pringle informs us, he hath known a cure effected by a milk and farinaceous diet; and he thinks in all cases the disorder would be much more easily removed, if the patients could be prevailed on to abstain entirely from spirituous liquors and animal-food. If the milk by itself should

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turn sour on the stomach, a third part of lime-water may be added. In one case he found a patient receive more benefit from good butter-milk than from sweet-milk. The chief drinks are decoctions of barley, rice, calcined hartshorn, toast and water, or milk and water.

315 Sp. IV. The Coeliac Passion.

Cœlica chylosa, *Sauv.* sp. 1.
Cœlica lactea, *Sauv.* sp. 4.

There are very great differences among physicians concerning the nature of this disease. Sauvages says, from Aretæus, it is a chronic flux, in which the aliment is discharged half digested. It is attended with great pains of the stomach, resembling the pricking of pins; rumbling and flatus in the intestines; white stools, because deprived of bile, while the patient becomes weak and lean. The disease is tedious, periodical, and difficult to be cured. Sauvages adds, that none of the moderns seem to have observed the disease properly; that the excrements indeed are white, on account of a deficiency of the bile, but the belly is bound as in the jaundice. Dr Cullen says there is a dejection of a milky liquid of the nature of chyle; but this is treated by Vogel as a vulgar error. He accuses the moderns of copying from Aretæus, who mentions white fæces as a symptom of the distemper; from whence authors have readily fallen into the notion that they never appeared of any other colour in persons labouring under the cœliac passion. This error quickly produced another, which has been very generally received; namely, that the chyle was thrown out of the lacteals by reason of some obstruction there, and thus passed along with the excrements; of which he says there is not the least proof, and agrees with Aretæus that the whiteness is only occasioned by the want of bile. He endeavours to prove at length, that the cœliac passion can neither be occasioned by an obstruction of the lacteals, nor of the mesenteric glands; though he owns that such as have died of this disease and were dissected, had obstructions in the mysenteric glands; but he denies that all those in whom such obstructions occur, are subject to the cœliac passion. He considers the distemper as arising from a cachexy of the stomachic and intestinal juices; and directs the cure to be attempted by emetics, purgatives, antiseptics, and tonics, as in other species of diarrhœa.

316 Sp. V. The Lientery.

Lienteria spontanea, *Sauv.* sp. 2.

The lientery, according to Sauvages, differs from the cœliac passion only in being a slighter species of the disease. The aliment passes very quickly through the intestines, with scarce any alteration. The patients do not complain of pain, but are sometimes affected with an intolerable hunger. The cure is to be attempted by stomachics and tonics, especially the Peruvian bark. This disease is most common in the earlier periods of life; and then rhubarb in small quantities, particularly when combined with magnesia, is often productive of the best effects.

Diarrhœa.

Sp. VI. The *Hepatic Flux*.
Hepatirrhœa intestinalis, *Sauv.* sp. 2.

The hepatic diarrhœa is by Sauvages described as a flux of bloody serous matter like the washings of flesh, which percolates through the coats of the intestines by means of the anastomosing vessels. It is the cœliac passion of Trallianus; and which, according to Sauvages, rarely, if ever, occurs as a primary disease. It has, however, been observed to follow an inflammation of the liver, and then almost always proves fatal. 317

Genus LXII. DIABETES. 318
A profuse Discharge of Urine.

Diabetes, *Sauv.* gen. 263. *Lin.* 197. *Vog.* 115. *Sag.* gen. 190. *Junck.* 99 *Dobson*, Med. Observat. Vol. V. p. 298. *Home*'s Clinical Experiments, sect. xvi.
Diuresis, *Vog.* 114.

Sp. I. The Diabetes with *sweet Urine*. 319

Diabetes Anglicus, *Sauv.* sp. 2. *Mead* on Poisons, Essay I Ejusdem Monita Med. cap. ix. sect. 2. *Dobson* in Lond. Med. Observ. Vol. V. art. 27 *Myers* Diss. inaug. de Diabete, Edinb. 1779.
Diabetes febricosus, *Sauv.* sp. 7. *Sydenh.* Ep. resp. ad R. Brady.

Sp. II. Diabetes with *insipid Urine*. 320

M. Lister Exerc. Medicin. II. de Diabete.
Diabetes legitimus, *Sauv.* sp. 1. *Aretæus* de Morb. diuturn. lib. ii. cap. 2.
Diabetes ex vino, *Sauv.* sp. 5. *Ephem. Germ.* D. I. A. II. Observ. 122.

Description. The diabetes first shows itself by a dryness of the mouth and thirst, white frothy spittle, and the urine in somewhat larger quantity than usual. A heat begins to be perceived in the bowels, which at first is a little pungent, and gradually increases. The thirst continues to augment by degrees, and the patient gradually loses the power of retaining his urine for any length of time. It is remarkable, that though the patients drink much, the quantity of urine always exceeds what is drank. In Dr Home's Clinical Experiments we have an account of two patients labouring under this disease: one of them drank between 10 and 12 English pints a-day without being satisfied. The quantity was greater in the forenoon than in the afternoon. In the other the case was reversed. He drank about four pints a-day, and more in the afternoon than the forenoon. The former passed from 12 to 1[illegible] pints of urine in the day: the latter, 11 or 12; so that his urine always exceeded his drink by eight, or at least seven pints. When the urine is retained a little while, there is a swelling of the loins, ilia, and testes: in this disease the strength gradually decays; the skin is dry and shrivelled; œdematous swellings arise in various parts of the body, but afterwards subside without relieving the disease in the least; and the patient is frequently carried off by convulsions.

The most singular phenomenon in this disease is, that the urine seems to be entirely or very much divested

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vested of an animal-nature, and to be largely impregnated with a saccharine salt scarce distinguishable from that obtained from the sugar-cane. This discovery was first made by Dr Dobson of Liverpool, who made some experiments on the urine of a person labouring under a diabetes, who discharged 28 pints of urine every day, taking during the same time from 12 to 14 pounds of solid and liquid food. Some of this urine being set a-side, fell into a spontaneous effervescence, changed first into a vinous liquor, and afterwards into an acetous one, before it became putrid and offensive. Eight ounces of blood taken from the same patient, separated into crassamentum and serum; the latter being sweet to the taste, but less so than the urine. Two quarts of the urine, evaporated to dryness, left a white cake weighing four ounces two drachms and two scruples. This cake was granulated, and broke easily between the fingers: it smelled sweet like brown sugar; neither could it by the taste be distinguished from sugar, except that it left a slight sense of coolness on the tongue. The experiment was repeated after the patient was recovered to such a degree as to pass only 14 pints of urine a-day. There was now a strong urinous smell during the evaporation; and the residuum could not be procured in a solid form, but was blackish, and much resembled very thick treacle. In Dr Home's patients, the serum of the blood had no preternatural sweetness; in one of them the crassamentum was covered with a thick inflammatory crust. In one of these patients the urine yielded an ounce and a half, and in the other an ounce, of saccharine matter from each pound. It had, however, an urinous smell, and a saline taste mixed with the sweet one; and the urine of one fermented with yeast, we are told, into "tolerable small-beer." Both these patients had a voracious appetite, and perpetual gnawing sense of hunger; as had also Dr Dobson's patient. The insipid urine of those affected with diabetes has not been examined by physicians with sufficient accuracy to enable us to speak with confidence of its contents.

Causes. These are exceedingly obscure and uncertain; spasms of the nervous system, debility, and every thing inducing it, but especially strong diuretics and immoderate venery, have been accused as bringing on the diabetes. It has, however, occurred in persons where none of all these causes could be suspected; nor have the best physicians been able to determine it.—Dissections have only shown that the kidneys were in an enlarged and lax state. In one of Dr Home's patients who died, they smelled sour; which showed that the urine peculiar to diabetes came from the kidneys, and was not sent directly from the intestines by a retrograde motion of the lymphatics, as some imagine.

Prognosis. The diabetes is rarely cured, unless when taken at the very beginning, which is seldom done; and in a confirmed diabetes the prognosis must therefore be unfavourable.

Cure. As there is reason to believe that in this affection the morbid secretion of urine, which is both preternatural in point of quantity and of quality, arises from a morbid diminution of tone in the kidney, the great object in the cure must be the restoration of due tone to the secreting vessels of the kidney. But as even this diminished tone would not give rise to the peculiar vitiated secretion without a morbid sensibility of that organ, it is necessarily a second object to remove this morbid sensibility. But besides this, the morbid secretion of urine may also be counteracted both by a diminution of the determination of fluids to the kidney, and by preventing the occurrence of superfluous water in the general mass of blood.

On these grounds the principal hopes of a cure in this distemper are from astringent and strengthening medicines. Dr Dobson's patient was relieved by the following remedies; which, however, were frequently varied, as none of them produced their good effects for any length of time: The bark in substance, with small doses of rhubarb; decoction of the bark, with the acid elixir of vitriol; the cold infusion of the bark, of which he drank from a quart to two quarts daily; Dover's powder; alum-whey; lime-water; antimonials combined with *tinctura Thebaica*. The warm bath was used occasionally when the skin was remarkably hot and dry, and the patient complained of restlessness and anxiety. The tincture of cantharides was likewise tried; but he could never take more than 25 drops for a dose, without exciting great uneasiness in his bowels. The body was kept constantly open, either with rhubarb or the infusion of sena joined with rhubarb. His common drinks were rice-water, barley-water, lime-water, and milk; lime-water alone; sage, balm, or mint-tea; small-beer, simple water, and water acidulated with the vitriolic acid. In seven months, these remedies, in whatever manner varied, made no further progress in removing the disease. In Dr Home's patients, all these medicines, and many others, were tried without the least good effect; insomuch that he uses this remarkable expression: "Thus, these two patients have exhausted all that experience had ever recommended, and almost all that theory could suggest; yet, in both cases, the disease has resisted all the means of cure used." It is remarkable, that though septics were given to both, in such quantity as evidently to produce a putrescency in the *primæ viæ*, the urine remained unaltered both in quantity and quality.

But although this disease be frequently in its nature so obstinate as to resist every mode of cure, yet there can be no doubt that particular remedies have succeeded in different cases. Dr Brisbane relates several cases cured by the use of tincture of cantharides: and Dr M'Cormick has related some in the 9th volume of the Edinburgh Medical Commentaries, which yielded to Dover's powder after a variety of other remedies had been tried in vain.

Genus LXIII. HYSTERIA. Hysterics.

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Hysteria, *Sauv.* gen. 135. *Lin.* 126. *Vog.* 219. *Sag.* gen. 242.

Malum hystericum, *Hoffm.* III. 50. *Junck.* 36.

Affectio hysterica, *Willis* de Morb. Convulsiv. cap. 5. 10. 11. *Sydenham* Diss. Epist. ad G. Cole, *Whytt* on Nervous Disorders.

Description. The hysteria is a convulsive disease, which comes on at uncertain intervals, sometimes longer and sometimes shorter, but at no stated time. The paroxysms commonly begin with a languor and debility

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lity of the whole body; yawning, stretching, and restlessness. A sense of coldness also in the extremities, almost always precedes, and for the most part remains during the whole time of, the paroxysm. To this sometimes succeeds a sense of heat; and the two sensations alternate with each other in different parts of the body. The face is sometimes flushed and sometimes pale; and sometimes the paleness and flushing come alternately. There is a violent pain in the head; the eyes become dim, and pour out tears; there is a rumbling and inflation of the intestines; a sensation is felt like that of a globe ascending from the lower part of the abdomen or hypogastrium, which sometimes seems to roll along the whole alimentary canal. It ascends to the stomach, sometimes suddenly, sometimes slowly; and there produces a sense of inflation and weight, together with anxiety, nausea, and vomiting. At last it comes up to the throat, where it produces a sense of suffocation, and difficulty of breathing or swallowing. During this time there are the most violent pains both in the external and internal parts of the abdomen; the muscles are convulsed; the umbilicus is drawn inwards; and there are frequently such spasms of the intestines, that neither clysters can be injected, nor even flatus pass downwards. Sometimes the paroxysm remits after these symptoms have continued for a certain time, but more frequently the patients fall into fainting fits; sometimes they lie without motion, as if they were in a deep sleep; sometimes they beat their breasts violently and continually with their hands, and sometimes they are seized with general convulsions, and the disease puts on the appearance of an epilepsy. In some patients the extremities become cold and stiff, and the body has the appearance of one in a catalepsy. Sometimes a most violent beating pain takes place in some part of the head, as if a nail was driving into it, and all visible objects seem to turn round; grievous pains attack the loins, back, and bladder, and the patients make a surprising quantity of urine as limpid as water; which last is one of the surest signs of the disease. The mind is very much affected as well as the body. Sometimes the patients are tormented with vain fears; sometimes they will laugh, at other times cry immoderately; and sometimes their temper becomes so peevish and fretful, that they cannot enjoy a moment's quiet. The appearances which take place in this affection are indeed so much varied, that they can hardly be enumerated: they may, however, with propriety, be divided into hysteric fits, which very much resemble those of epilepsy, excepting that they are not attended with an abolition of the internal senses; and hysteric symptoms, such as the *globus hystericus*, *clavus hystericus*, and the like, which are chiefly known to constitute a part of this disease from being observed to alternate with fits.

Causes, &c. The general cause of hysteria is thought by the best physicians to consist in a too great mobility and irritability of the nervous system, and of consequence the disease may be brought on by whatever debilitates and renders the body irritable. Hence it most frequently attacks females of a weak and lax habit of body, though there are some instances of men also attacked by it. It generally comes on between the time of puberty and the age of 35, and makes its attacks during the time of menstruation more frequently

than at any other. It also more frequently seizes barren women and young widows, than such as are bearing children. Hysteria.

Prognosis. Though the appearance of this disease be so very terrible, it seldom proves mortal unless by wrong treatment: but notwithstanding this it is extremely difficult of cure, and rarely admits of any thing else than being palliated; for though it should seem to be conquered by medicine for a time, it very quickly returns, and that from the slightest causes.

Cure. The ends principally to be aimed at in the cure of this disease are, in the first place, the removal of particular convulsive or spasmodic affections immediately producing various appearances in the disease, whether under the form of proper hysteric fits, or merely of what may be called hysteric symptoms; and in the second place, the prevention of the return of symptoms after they have been removed, by the employment of proper remedies during those intervals from complaints which patients often have when labouring under this affection.

The most powerful remedy hitherto discovered in hysteric cases is opium, or the tincture of it called *laudanum*. By this commonly the most violent paroxysms are stopped, though it be insufficient to accomplish a radical cure. In Dr Home's Clinical Experiments we find an instance of a cure performed by venesection, though this remedy has been generally condemned in hysterical cases. Asafœtida seems to stand next in virtue to opium; though with some it disagrees, and occasions pains in the stomach and vomiting. Æther will also frequently remove an hysteric fit: but its effects are of short duration; and if it do not effect a cure soon after its exhibition, no service is to be expected either by perseverance in the use of it or by increasing the dose; and with some constitutions it disagrees to such a degree as to occasion convulsions. If the patient be seized with a violent fit, so that she can swallow nothing, which is frequently the case, it will be proper to apply some strong volatile alkali to her nose; or if that be not at hand, the vapour of burning feathers is sometimes very efficacious. In some instances benefit is derived from the sudden application of cold water to the face or hands; but still more frequently the application of water in a tepid state, particularly the warm pediluvium, is found to be of very great service in bringing about a favourable termination of different violent hysteric symptoms. A plaster of galbanum and asafœtida will also prove serviceable: but it must be remembered, that none of these things will prevent the return of the disease; and therefore a radical cure is to be attempted by exercise, the Peruvian bark, chalybeates, mineral waters, and other tonics; but particularly, where the state of the patient is such as to be able to bear it, by the use of the cold bath, which, where it does not disagree with the constitution, is often of the greatest service in preventing returns of this affection.

Genus LXIV. HYDROPHOBIA. 322
The *Dread* of Water.

Hydrophobia, *Sauv.* gen. 231. *Lin.* 86. *Vog.* 30. *Sag.* gen. 343. *Boerh.* 1138. *Junck.* 124. *Mead* on poisons. *Desault* sur la rage. *Sauv.* diss. sur la rage. *James* on canine madness. *Daily*, Vir-

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tues of cinnaber and musk against the bite of a mad dog. *Nugent* on the hydrophobia. *Choisel*, Nouvelle methode pour le traitement de la rage. *Journal de Medicine*, passim. *Medical Obs. and Inquiries*, vol. iii art 34. vol. v. art. 20. 26. and App. *Med. Transact.* vol. ii. art. 5. 12. and 15. *Heysham*, Diss. inaug. de rab. canin. Edinb. 1777. *Porry*, Diss. inaug. de rab. contagios. sive canin. Edinb. 1778. *Andry*, Recherches sur la rage, 1778. *Vaughan*, Cases of hydrophobia, second edit. 1778.

323 Sp I. *Hydrophobia Rabiosa*, or Hydrophoby consequent on the *Bite* of a *Mad Animal*.
Hydrophobia vulgaris, *Sauv.* sp. 1.

It is the opinion of some, that Dr Cullen has done wrong in employing the term *hydrophobia* as a generic name, under which canine madness is included: and it must be allowed, that the dread of water, while it is not universal, is also a symptom occurring only late in the disease, at least in the greater part of cases. Perhaps his arrangement would have been less exceptionable, if, following Linnæus, he had adopted *rabies* as a generic term, and had distinguished this particular species by the epithet of *canina*, *contagiosa*, or the like. Disputes, however, about names, are in general not very important; and it is sufficient to observe, that the affection now to be treated of is canine madness, or that disease which arises from the bite of a mad animal.

Description. This disease commonly does not make its attack till a considerable time after the bite. In some few instances it has commenced in seven or eight days from the acident; but generally the patient continues in health for 20, 30, or 40 days, or even much longer. The bite, if not prevented, will in general be healed long before that time, frequently with the greatest ease; though sometimes it resists all kinds of healing applications, and forms a running ulcer which discharges a quantity of matter for many days. It has been said, that the nearer the wounded place is to the salivary glands, the sooner the symptoms of hydrophobia appear. The approach of the disease is known by the cicatrix of the wound becoming high, hard, and elevated, and by a peculiar sense of prickling at the part; pains shoot from it towards the throat: sometimes it is surrounded with livid or red streaks, and seems to be in a state of inflammation; though frequently there is nothing remarkable to be observed about it. The patient becomes melancholy, loves solitude, and has sickness at stomach. Sometimes the peculiar symptom of the disease, *the dread of water*, comes on all at once. We have an instance of one who, having taken a vomit of ipecacuanha for the sickness he felt at his stomach, was seized with the hydrophobia in the time he was drinking the warm water. Sometimes the disease begins like a common sore throat; and the soreness daily increasing, the hydrophobic symptoms show themselves like a convulsive spasm of the muscles of the fauces. In others, the mind seems to be primarily affected, and they have a real *dread* of water or any liquid before they try whether they can swallow it or not. Dr James, in his Treatise on Canine Madness, mentions a boy sent out to fill two bottles with water, who was so terrified by the noise of the liquid running into them, that he fled into the house crying out that he was bewitched. He mentions also the case of a farmer, who, going to draw some ale from a cask, was terrified to such a degree at its running into the vessel, that he ran out in a great haste with the spigot in his hand. But in whatever manner this symptom comes on, it is certain that the most painful sensations accompany every attempt to swallow liquids. Nay, the bare sight of water, of a looking-glass, of any thing clear or pellucid, will give the utmost uneasiness, or even throws the patient into convulsions.

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With regard to the affection of the mind itself in this disease, it does not appear that the patients are deprived of reason. Some have, merely by the dint of resolution, conquered the dread of water, though they never could conquer the convulsive motions which the contact of liquids occasioned: while this resolution has been of no avail; for the convulsions and other symptoms increasing, have almost always destroyed the unhappy patients.

In this disease there seems to be an extreme sensibility and irritability of the nervous system. The eyes cannot bear the light, or the sight of any thing white; the least touch or motion offends them, and they want to be kept as quiet and in as dark a place as possible. Some complain of the coldness of the air, frequently when it is really warm. Others complain of violent heat; and have a great desire for cold air, which yet never fails to increase the symptoms. In all there is a great flow of viscid saliva into the mouth; which is exceedingly troublesome to the patients, as it has the same effect upon their fauces that other liquids have. This therefore they perpetually blow off with violence, which in a patient of Dr Fothergill's occasioned a noise not unlike the hollow barking of a dog, and which he conjectures might have given rise to the common notion that hydrophobous patients bark like dogs. They have an insatiable thirst; but are unable to get down any drink, except with the utmost difficulty; though sometimes they can swallow bread soaked in liquids, slices of oranges, or other fruits. There is a pain under the *scrobiculus cordis*, as in the tetanus; and the patients mournfully point to that place as the seat of the disease. Dr Vaughan is of opinion that it is this pain, rather than any difficulty in swallowing, which distresses the patient on every attempt to drink. The voice is commonly plaintive and mournful; but Dr Vaughan tells us there is a mixture of fierceness and timidity in the countenance which he cannot describe, but by which he could know a hydrophobous person without asking any questions.

In this distemper, indeed, the symptoms are so various, that they cannot be enumerated; for we will seldom read two cases of hydrophobia which do not differ very remarkably in this respect. Some seem to have at times a furious delirium, and an inclination to spit at or bite the bystanders; while others show no such inclination, but will even suffer people to wipe the inside of their mouths with the corner of a handkerchief in order to clear away the viscid saliva which is ready to suffocate them. In some male patients there is an involuntary erection of the penis, and emission of the

Spasmi the semen; and the urine is forced away by the frequent return of the spasms. In a letter from Dr Wolf of Warsaw to Henry Baker, F. R. S dated Warsaw Sept. 26th, 1767, we have the following melancholy account of the cases of five persons who died of the hydrophobia: "None of them quite lost their right senses; but they were all talking without intermission, praying, lamenting, despairing, cursing, sighing, spitting a frothy saliva, screeching, sometimes belching, retching, but rarely vomiting. Every member is convulsed by fits, but most violently from the navel up to the breast and œsophagus. The fit comes on every quarter of an hour; the fauces are not red, nor the tongue dry. The pulse is not at all feverish; and when the fit is over nearly like a sound pulse. The face grows pale, then brown, and during the fit almost black; the lips livid; the head is drowsy, and the ears tingling; the urine limpid. At last they grow weary; the fits are less violent, and cease towards the end; the pulse becomes weak, intermittent, and not very quick; they sweat, and at last the whole body becomes cold. They compose themselves quietly as if to get sleep, and so they expire. The blood drawn a few hours before death appears good in every respect. A general observation was, that the lint and dressings of the wounds, even when dry, were always black, and that when the pus was very good in colour and appearance." In one of Dr Wolf's patients who recovered, the blood stunk intolerably as it was drawn from a vein; and one of Mr Vaughan's patients complained of an intolerable fetid smell proceeding from the wounded part, though nobody but himself could perceive it. In general, the violent convulsions cease a short time before death; and even the hydrophobia goes off, so that the patients can drink freely. But this does not always happen; for Mr Vaughan mentions the case of a patient, in whom, "when he had in appearance ceased to breathe, the spasmus cynicus was observable, with an odd convulsive motion in the muscles of the face; and the strange contrariety which took place in the action of these produced the most horrid assemblage of features that can well be conceived. Of this patient also it was remarkable, that in the last hours of his life he ceased to call for drink, which had been his constant request; but was perpetually asking for something to eat."

The hydrophobia seems to be a symptom peculiar to the human race; for the mad animals which communicate the infection, do not seem to have any dread of water. Dr Wolf, in the letter above quoted, says in general, that cattle bit at the same time and by the same animal (a mad wolf) which bit the persons whose cases he related, died nearly with the same frightful raging as the men; but says nothing of their having any hydrophobia: nay, Dr James and some others assert, that the hydrophobia is not always an attendant on rabies canina in the human race; and indeed it is certain that the disease has proved mortal after this terrible symptom has been removed. With regard to the symptoms of madness in dogs, they are very equivocal; and those particularly enumerated by some authors, are only such as might be expected in dogs much heated or agitated by being violently pursued and struck. One symptom indeed, if it could be depended upon, would determine the matter; namely, that all other dogs avoid and run away from one that is mad; and even large dogs will not attack one of the smallest size who is infected with this disease. Upon this supposition they point out a method of discovering whether a dog who hath been killed was really mad or not; namely, by rubbing a piece of meat along the inside of his mouth, and then offering it to a sound dog. If the latter eats it, it is a sign the dog was not mad; but if the other rejects it with a kind of howling noise, it is certain that he was. Dr James tell us, that among dogs the disease is infectious by staying in the same place; and that after a kennel has been once infected, the dogs put into it will be for a considerable time afterwards in danger of going mad also. A remedy for this, he says, is, to keep geese for some time in the kennel. He rejects as false the opinion that dogs when going mad will not bark; tho' he owns that there is a very considerable change in their bark, which becomes hoarse and hollow. Hydrophobia.

Causes, &c. In no disease whatever are we more at a loss to discover the causes than in the hydrophobia. In dogs, foxes, and wolves, it seems to come on spontaneously; though this is contested by some authors. It is said, that the causes commonly assigned, viz. heat, feeding upon putrid flesh, want of water, &c. are not sufficient for producing the distemper. It does not appear that madness is more frequent among dogs in the warm than in the cold climates; nay, in the island of Antigua, where the climate is very hot, and the water very scarce, this distemper has never, it is said, been observed. As to putrid aliment, it seems natural for dogs to prefer this to any other, and they have been known to subsist upon it for a long time without any detriment. For these reasons, they think the disease arises from a specific contagion, like the small pox and measles among the human race, which, being once produced by causes unknown, continues to be propagated by the intercourse which dogs have with each other, as the diseases just mentioned continue to be propagated among the human race by means of the intercourse which they have with one another.

With regard to the immediate cause among mankind, there is not the least doubt that the hydrophobia is occasioned by the saliva of the mad animal being mixed with the blood. It does not appear that this can operate through the cuticula; but, when that is rubbed off, the smallest quantity is sufficient to communicate the disease, and a slight scratch with the teeth of a mad animal has been found as pernicious as a large wound. It is certain also, that the infection has been communicated by the bites of dogs, cats, wolves, foxes, weasels, swine, and even cocks and hens, when in a state of madness. But it does not appear that the distemper is communicable from one hydrophobous person to another, by means of the bite, or any other way. Dr Vaughan inoculated a dog with the saliva of a hydrophobous child, but the animal continued free from disease for two months; and though the doctor promised to inform the public if it should happen to occur afterwards, nothing has hitherto appeared on that subject. A nurse also frequently kissed the child during this time of his disorder, but no bad consequence ensued.

When we attempt to investigate the nature of the

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caufe of the hydrophobia by diffections, our inquiries are commonly difappointed. In two bodies opened by Dr Vaughan, there was not the leaft morbid appearance; in the very fauces, where we might have expected that the difeafe would have fhown itfelf moft evidently, there was not the leaft appearance even of inflammation. The ftomach, inteftines, diaphragm, œfophagus, &c. were all in a natural ftate: neither do we find in authors of credit any certain accounts of morbid appearances in the bodies of hydrophobous perfons after death. Dr Vaughan therefore concludes, that the poifon acts upon the nervous fyftem; and is fo wholly confined to it, that it may be doubted whether the qualities of the blood are altered by it or not; and that it acts upon the nerves by impairing and difturbing their functions to fuch a degree as fpeedily to end in a total extinction of the vital principle. As to the difficulty in fwallowing generally believed to accompany dread of the water, he treats it as a mifreprefentation, as well as that the œfophagus with the mufcles fubfervient to deglutition are efpecially concerned in this difeafe. The principal foundation of the evil, he thinks, refts on a morbid fenfibility both of the external and internal fauces. For the fight of a liquid, or the application of any fubftance to the internal fauces, but more efpecially of a fluid, inftantly excites the moft painful feelings. Nay, the fame fymptoms are produced by touching the external fauces with a fluid, or by the contact of cold air with thefe parts; and nearly in as great a degree. But a folid or a fluid fubftance being conveyed into the œfophagus, the tranfit into the ftomach is accomplifhed with little or no impediment; fo that in fact the difficulty is furmounted before the patient be engaged in the action of fwallowing. Nor is the excruciating pain, which never fails to be the companion of every attempt to drink, felt in the *fauces* and *throat*: it is, he fays, at the *fcrobiculus cordis*; to which the fufferer applies his hand. From this laft circumftance, therefore, from the prefence of the *rifus fardonius*, from the mufcles of the abdomen being forcibly contracted, and from the fenfe of fuffocation which feems to threaten the patient with immediate death, Dr Vaughan has been led to think that in the hydrophobia a new fympathy was eftablifhed between the fauces, the diaphragm, and the abdominal mufcles.

Prognofis. When a perfon is bit, the prognofis with regard to the enfuing hydrophobia is very uncertain. All thofe who are bit do not fall into the difeafe; nay, Dr Vaughan relates that out of 30 bit by a mad dog, only one was feized with the hydrophobia. During the interval betwixt the bite and the time the difeafe comes on, there are no fymptoms by which we can judge whether it will appear or not. When once it hath made its appearance, the prognofis is exceedingly fatal.

Prevention and Cure. It has been generally allowed by practitioners, that though the hydrophobia may be prevented, yet it can feldom if ever be cured after it has made its appearance. The moft effential part of the treatment therefore depends on the proper ufe of means of prevention. The great objects to be aimed at in prevention, are, in the firft place, the complete removal of the contagious matter as foon as poffible; or, fecondly, means of deftroying it at the part, where there is even the flighteft reafon to believe that it has not been completely removed. Of all the means of removal, the complete cutting out the part to which the tooth has been applied, is unqueftionably the moft to be depended upon. This practice, therefore, fhould be had recourfe to as foon as poffible. The fooner it can be accomplifhed, the better. But as it has been obferved, that a peculiar fenfation at the part affected always precedes the acceffion of the difeafe, even when it takes place at a late period after the bite, there is good ground for believing that removal of the part may be of advantage even after a confiderable interval. But befides removal of the contagious matter, by cutting away the part to which it is attached, this fhould alfo be done by careful and long continued wafhing. This may be done, in moft inftances, before a proper opportunity can be had of having recourfe to the knife. Cold water fhould particularly be poured upon the wound from a confiderable height, that the matter may be wafhed away with fome force. Even after removal by the knife, careful wafhing is ftill a neceffary and proper precaution. And after both thefe, to prevent as far as can be the poffibility of any contagious matter lurking about the wounded part, it fhould not be allowed to heal, but a difcharge of matter fhould be fupported for the fpace of feveral weeks, by ointment with cantharides, or fimilar applications. By thefe means there is at leaft the beft chance of removing the matter at a fufficiently early period. And this mode of prevention feems to be of more confequence than all others put together which have hitherto been difcovered. But befides removal, prevention may alfo be obtained by the deftruction of the contagious matter at the part; and where there is the leaft reafon to think that a complete removal has not been obtained, thefe fhould always be had recourfe to. With this intention the actual cautery and burning with gun-powder have been employed. And the action of fire is probably one of the moft powerful agents that can be ufed for this purpofe. But recourfe has alfo been had to wafhing both with acids and with alkalies. Of the former kind, vinegar has been chiefly ufed, but more may probably be expected from the latter; and particularly from the cauftic alkali, fo far diluted that it can be applied with fafety: for from its influence as a folvent of animal mucus, it gives a better chance of a complete removal of the matter, independent of any influence in changing its nature. It has been thought alfo, that oil applied to the part may be of fervice. But if recourfe be had to it, more active meafures fhould at leaft be previoufly employed; and even then, fome are of opinion that it is of advantage to increafe the activity of the unctuous matter by combining it with mercury.

On thefe grounds, and by thefe means, we are inclined to think that the action of this contagion on the fyftem, after it has been applied by the bite of a rabid animal, may be moft effectually prevented. But after this action has once taken place, no remedy has yet been difcovered on which much dependence can be put. A very great variety of articles indeed have at different periods been held forth as infallible, both in the prevention and cure of this affection; but their reputation has, perhaps, univerfally been founded on their being given to people, who, though really bit

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bit by a mad dog, were yet not infected with the contagion. And this happily, either from the tooth being cleaned in making the bite, or not being covered with contagious matter, is by no means an unfrequent occurrence. Mankind, however, even from the earliest ages, have never been without some boasted specific, which has been held forth as an infallible remedy for this affection till fatal experience demonstrated the contrary. Dr Boerhaave has given a pretty full catalogue of those specifics from the days of Galen to his own time; and concludes, that no dependence is to be put in any of them. It is now, therefore, altogether unnecessary to take notice of burnt crabs, the hyæna's skin, mithridate with tin, liver of the rabid animal, or a variety of other pretended remedies for this disease, proved by experience to be totally inefficacious. But although no greater confidence is perhaps to be put on specifics of modern date, it will be proper that these should be mentioned.

Bathing in cold water, especially in the sea, and drinking sea-water for a certain time, have been prescribed, and by some accounted a certain preventive. When this was known to fail, a long course of antiphlogistic regimen, violent submersion in water, even to danger of drowning, and keeping the wounded place open with cauteries, were recommended.—To this extreme severity Dr Mead objected; and in his treatise on this subject endeavours to show, that in all ages the greatest success has been reaped from diuretics, for which reason he proposes the following powder: "Take ash-coloured ground-liverwort, half an ounce; black-pepper, two drachms: reduce them separately to powder, then mix them together." This powder was first published in the Philosophical Transactions, by Mr Dampier, in whose family it had been kept as a secret for many years. But this medicine, which was inserted in former editions of the London and Edinburgh pharmacopœias, under the name of *Pulvis Antilyssus*, has long lost its credit.

There is a famous East-India medicine, composed of 24 grains of native and as much factitious cinnabar, made into a powder with 16 grains of musk. This is called the *Tonquin* medicine, and must be taken into a tea-cupful of arrac or brandy; and is said to secure the patient for 30 days, at the expiration of which it is to be repeated; but if he has any symptoms of the disease, it must be repeated in three hours, which is said to be sufficient for a cure. The first dose is to be taken as soon after the bite as possible.

Another celebrated remedy is Palmarius's powder, composed of the leaves of rue, vervain, sage, polypody, wormwood, mint, mugwort, balm, betony, St John's-wort, and lesser centaury. These herbs must be gathered in their prime, dried separately in the shade, and then powdered. The dose is a drachm, or a drachm and an half, taken every day.

A remedy which might promise to be more efficacious than any of those hitherto mentioned is mercury. This hath been recommended in frictions, and to be taken inwardly in the form of calomel and turbith-mineral, in order if possible to raise a slight salivation, on which the efficacy was thought to depend. Besides this, venefection, opium, the bark, and camphor, have been tried in very large quantities; the warm bath; and, in short, every thing which human invention could suggest; but with what success, can best be judged from the following well authenticated cases.

In the beginning of December 1728, a young gentleman, aged 17, was bit by a dog in the middle-finger of the right-hand about the middle of the nail. In the beginning of January 1729, he complained of pain in that finger reaching along the back of the hand to the elbow. In the night between the sixth and seventh days of that month, he became hot and restless: emollient and anodyne fomentations were applied; but the pain became very sharp, and the hydrophobia came on in the night-time. He was blooded; but became worse every hour, and at last quite furious and outrageous. The bandage was thrown off from his arm, and he lost about 20 ounces of blood besides what had formerly been taken from him. This, however, made no abatement of the symptoms, and he died the same night.

In 1753, a woman, seized with the hydrophobia in consequence of the bite of a dog supposed to be mad, was treated in the following manner by Dr Nugent. First she was blooded to about 15 ounces; she took 16 grains of musk in powder, and alongst with it a pill of two grains of pure opium, every three hours. A plaster of galbanum, with half an ounce of pure opium, was laid to her neck and throat. She began to take these medicines on a Saturday morning, an hour or two after the dread of water had commenced. In the evening she was a little easier at intervals. The musk and opium pill were continued as before, and the hand that was bit was ordered to be chafed with warm salad oil several times a day. Only two papers of powder and two pills were taken in the night, for the last made her sick and vomit. She had little or no sleep, but lay pretty quiet. On Sunday, 20 ounces of blood were taken away, and a clyster with antimonial wine injected: the pills and powders were continued as before. On Sunday evening she could swallow liquids a little better, and she lay quiet most of the night. On Monday her swallowing was greatly better. The musk and opium were continued, and twelve ounces more of blood were taken from her; the plaster was renewed with only two drachms of opium, and the oil was used as before. At night she was better: her hand easy; and by a continuance of these remedies she recovered. This was the case which chiefly brought opium into reputation.

The following cases published by M. Dessault, a Frenchman, first brought mercury into reputation.—Four men were bitten by the same wolf, on the same day, at the same hour. They were dipped in salt-water, and came back persuaded that they had nothing to fear. Some days after, one of them felt a numbed pain about his scars, while the scars themselves grew hard and rose like an embroidery: he was soon after seized with the usual symptoms, as was also another. The son of the former likewise began to feel a pain about the cicatrices, and a swelling with hardness; as did also the fourth. They were ordered to rub a drachm and a half of the mercurial or blue ointment upon the cicatrices and about the whole arm. This was repeated three days successively, and then every other day: after the fifth friction, he allowed an interval of two days. Besides this, they took every day a drachm and an half of Palmarius's powder. After the third friction the cicatrices grew flat and soft, the pain went

Spasmi went off, their courage returned, and their mind resumed its former tranquillity.

But how far mercury, or indeed any thing else, is from being a *specific* in the hydrophobia, will appear from the following account of Dr Wolf's patients.—In the middle of April 1767, seventeen people and a great number of cattle were bitten in the neighbourhood of Warsaw by a mad wolf. One of these, an officer, was brought into the city that same day, and had the best advice of the surgeons and physicians in that place; besides which, he took the bark very copiously with camphor. He continued well till the seventh week, when he became hydrophobous, and died.

Eleven of the others applied to Dr Wolf on the ninth day. Their wounds were all deeply scarified; diligently washed and fomented with vinegar, salt, and theriaca; and kept open till the 80th day, in those who lived so long. Every two weeks they were blooded largely, and were purged every week with salts and jalap. Their diet was mostly vegetable, and their drink whey and water. They all eat as much as could be got of the herbs *matrisylva* and *anagallis flore puniceo*; and they all took often of the *pulvis Palmarii*. The *muscus cinereus terrestris* could not be got, or it would also have been prescribed. Besides the general treatment, two were rubbed daily with a drachm of mercurial ointment, and had their purges with calomel. Two took every day four ounces of vinegar, three drachms tincture of poppies, and half an ounce of *rob sambuci* every night. One took every day 16 grains of camphor, with four scruples of saltpetre, and at night half an ounce of *rob sambuci*.—Two took 24 grains of musk, with 50 grains of cinnabar. Other two took from 40 to 60 drops of spirit of sal ammoniac, prepared with quicklime; and the last took a scruple of crystallized salt of tartar made by the mixture of a little spirit of sal ammoniac with a solution of that salt.

One of the first who used the mercurial ointment was seized with the hydrophobia on the 22d day, immediately after being well purged with calomel. He was blooded copiously, plunged abundantly in cold water, and had several clysters administered, without effect. Two pounds of oil, and as much of drink, were poured down by force; also a drachm of salt of tartar and half a drachm of musk were given in three doses. He then began to drink freely, but died the third day. His companion then left off the use of mercury, and took 80 drops a-day of Dippel's animal oil, till he had taken six drachms of it; after which he went on with 100 drops daily of spirit of sal ammoniac made with alkali.

One of those who took the vinegar fell sick the 33d day. He was immediately blooded, and vomited with ipecacuanha. This man was too strong to make experiments on by force: he refused every thing, and died the third day. His companion, an old man, began to be seized in the same manner: he was purged with salts, took the *morsulæ balsami Peruviani*, and drank lemonade. He recovered, and used afterwards 100 drops of spirit of sal ammoniac daily. This was the patient formerly mentioned, whose blood had the fetid smell.

The man who used the camphor fell sick the 33d day. He was thrice copiously blooded, was plunged forcibly into the coldest water for the space of two hours, and was nearly drowned. He was clystered with effect. He himself forced down, with incredible aversion and labour, a great quantity of drink; by which he vomited more than 50 times abundance of frothy slime. He took several ounces of oil, and several boluses of castor and opium, of each four grains, without effect; and died the fourth day.

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A girl who used the musk with cinnabar, fell ill the 62d day, and died the third day after. No farther attempt was made to save her life, she being then at a distance. Her companion, a pregnant woman, then left off the musk, and took in its stead spirit of sal ammoniac.

A woman who had taken nothing, fell ill on the 40th day. She suffered terribly in the night, but less in the day-time. Besides the usual symptoms, she had great pain and swelling in her belly. In the space of two days she drank about two bottles of brandy, but would taste no other liquor The Doctor ordered her to mix an equal quantity of oil with her brandy, and to take every day two boluses of castor and opium.—She recovered: and at last took two doses of turbith-mineral, by which she was vomited and purged.

After the 80th day, all the surviving people took thrice the turbith-mineral, except the pregnant woman; and they afterwards continued their alkaline medicines to the 100th day.

On these cases Dr Wolf makes the following observations.—"Thus we see, that the bark, the mercury, the acids, the musk, the feeding on the most famous herbs, the sweating, the *cura antiphlogistica*, are no specifics. I don't know what to say to the alkalies: the danger is not yet over; and there are still four people who used nothing, in as good health as my patients."

The following case by Dr Raymond of Marseilles, shows the inefficacy of mercury even as a *preventive*.—On the 19th of July 1765, Mr Boyer, aged 25, of a bloated cachectic habit, was bit by a mad dog in the inferior part of the leg: the wound extended half way round, bled freely, and was like a great scratch. The patient's legs had been swelled for a considerable time before the accident; and there were also two ulcers in the other leg. Some hours after the accident, the actual cautery was applied to the wound. The Doctor was not present at this operation; but the part around the bite was rubbed with mercurial ointment immediately after, and the eschar was dressed with the same ointment. The eschar was separated on the first day, but the dressing was continued till the wound was cicatrised. The second day a bolus of four grains of turbith and eight grains of camphor was exhibited. This procured a considerable evacuation both by vomit and stool, and a spitting also came on. The third day the bitten leg was rubbed with mercurial ointment: in the space of a month the frictions were repeated five times on both legs, three drachms of mercurial ointment being used in each friction. During the same time the bolus was five times repeated; and this treatment kept up a slight salivation to the 40th day. The evening of the third day he took the *Tonquin medicine*, called also *Sir George Cobb's powder*, in a bolus; which vomited him briskly. This powder was repeated seven or eight times in the month, generally with the same effect. During the first seven or eight days he got four times,

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times, in the morning, a drachm of the *anagallis flore puniceo*, fresh gathered and powdered. The 41st day, the turbith bolus was prescribed for the seventh time; he was bathed in the sea, and continued the bathing for two days more. On the 74th he was seized with the distemper; and died on the 76th, seemingly suffocated or strangled, his mouth covered with slaver, and his face bloated. He lost his senses not above half a quarter of an hour before his death. The pulse was quiet the whole time. The Doctor says he has reason to suspect the wound was not well cauterized.

Another instance is mentioned by the same author, of a pregnant woman bit by the same dog and on the same day with Mr Boyer, who was never seized with the distemper. She was treated in much the same manner with him, and salivated a little more. But she was bit through a shamoy leather shoe, which must necessarily have cleaned the animal's teeth of the poisonous saliva before they reached her skin, and to this we are naturally led to ascribe her safety. One of Dr Wolf's patients also was a pregnant woman, and was not seized with the distemper. Perhaps women in a state of pregnancy may be less liable to this distemper than others; but it is more probable that the contagion was not communicated.

The same author tells us, "there are many examples of the inefficacy of mercurial frictions. A surgeon of Marseilles treated a girl about 12 years of age bit by a mad dog, with mercurial frictions; applying them as in the *lues venerea*: yet she died of the hydrophobia on the 55th day. Her wound was not cauterized."

In the following case all the most powerful remedies were tried.—In the afternoon of the 29th of Aug. 1778, Dr Vaughan was called to a boy of eight years of age labouring under a hydrophobia. He had been bit on the wrist by a cat about a month before; of which the marks remained, but without any ulcer, or even the smallest appearance of inflammation. About the middle of the day before Dr Vaughan saw him, he began to complain of a pain in the part bitten, which ascended up the arm, and affected the temple on that side; soon after which he swallowed liquids with reluctance and difficulty. He was put into the warm bath for three quarters of an hour, during which time he was easier: he had a clyster of five ounces of fresh broth, and 30 drops of laudanum, injected immediately after his coming out of it; a liniment consisting of three drachms of strong mercurial ointment, with the same quantity of oil of amber, was rubbed upon the shoulders and back; two pills of a grain of flowers of zinc, and half a grain of *cuprum ammoniacum*, were taken every three or four hours; and a medicated atmosphere was prepared for him, by burning gum ammoniac in his room. As these remedies were not attended with any good effect, each dose of pills was ordered to contain two grains of *cuprum ammoniacum*, the same quantity of opium, three grains of flowers of zinc, and ten grains of asafœtida; whilst a solution of that fetid gum, with a drachm of laudanum, was administered as a clyster. These pills, though repeated every four hours, afforded not the smallest relief, nor did they show the least action on the frame. At last the Doctor resolved to put in practice the desperate remedy mentioned by Van Helmont, of throwing the patient into cold water, and keeping him there till he is almost drowned. With this view a large tub of cold water, well saturated with common salt, was prepared, into which the poor boy was plunged over head and ears, and there held until he ceased to struggle. He was then taken out again, and the same operation repeated until he became so quiet that the Doctor was under apprehensions that a total extinction of life would take place. He was then wrapped up in a blanket and put to bed, and he remained more quiet than he had formerly been; but all his former restlessness soon returned, his pulse sunk, and he died about two o'clock in the morning.

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Another celebrated antidote against the poison of a mad dog hath been known for some years by the name of the *Ormskirk medicine*. The true composition of this is kept a secret by the proprietors: however, it has been analysed, and the following composition published by Dr Heysham as perfectly similar to it in all respects.

"Take half an ounce of chalk, three drachms of Armenian bole, ten grains of alum, one drachm of elecampane in powder; mix them all together, and add six drops of oil of anise."

They must certainly be very credulous who can put confidence in such an insignificant medicine as a preservative against the hydrophobia: however, there is a possibility that there may be some unknown ingredient in the genuine powder; for it is difficult to analyse powders after the ingredients are thoroughly mixed together. The efficacy of the medicine therefore must depend on the virtues of that unknown ingredient, if any such there be. The following cases, however, too well determine that it is not *infallible*, as was at first pretended. In all probability, as well as many others, its reputation also is solely rested on its being exhibited in many cases where no contagion was communicated to the person bit, and while of course no disease could take place.

On the 14th of February 1774, Mr Bellamy of Holborn, aged 40, was bit by a cat, which was killed the same morning. The following day he took the celebrated Ormskirk medicine, sold by Hill and Berry in Hill-Street, Berkeley-Square, and conformed in every respect to the directions given by the vender. A servant-maid, who was bitten in the leg before her master was bitten, likewise took the same remedy. About the middle of April Mr Bellamy complained of a pain in his right knee, which he supposed to be rheumatic, and which continued and increased till the 7th of June, when he got some pills of calomel, ipecacuanha, and *pil. sapon.* from an apothecary, with Huxham's tincture of the bark in small doses. In six days more he had a titillation in the urethra, a contraction of the scrotum and penis to a degree of pain, and an emission of semen after making water, to which he had frequent calls. The medicines were discontinued; and on the 16th of that month the hydrophobia came on, and Dr Fothergill was called. Six ounces of blood were taken from his arm, and a bolus of a scruple of native cinnabar and half a scruple of musk was given every four hours. The distemper manifestly increased through the day. In the evening a clyster was injected, and several times repeated during the night; he had been put into the warm bath, and two drachms of strong mercurial ointment rubbed into his legs and thighs by himself.

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himself. He was greatly relieved by the warm bath while he continued in it, but the symptoms returned with increased violence in the night. The next day, being greatly worse, he was blooded to as great a quantity as he could bear, had the warm bath and clysters repeated, and half an ounce of mercurial ointment rubbed into his thighs and legs. Pills of opium were prescribed, but he did not take them. He died the same night, at half an hour after 12. This patient was a man of great resolution, and could in part conquer his aversion at water. He seemed to have totally forgot the accident of the bite: and casually said, that he thought this disorder resembled the hydrophobia, without supposing that he was afflicted with that distemper at the time.—The bite on the girl's leg refused to heal, baffled the art of a young surgeon who attempted to cure it, and continued a running ulcer for a long time. She did not fall into the hydrophobia. Hence Dr Fothergill thinks it probable, that keeping the wounds made by the teeth of mad animals open for a long time, would probably be of service as a preventive; but in some of Dr Wolf's patients, these artificial drains appear not to have been attended with success.

On the 16th of November 1773, Thomas Nourse, a strong healthy boy of 14, was admitted into the Leicester infirmary; having been that day month bitten by a mad fox-hound. The wound was a large lacerated one on the cheek, and bled very freely on being inflicted. The day after he was bit he went to the sea, where he was dipped with all the severity usually practised under so disagreeable an operation. The *Ormskirk medicine* was also administered with all due care. It was bought of the person in Leicester who is deputed by the proprietor to sell it for him. A common adhesive plaster was applied to the part after sea-bathing; and in the course of a month, without any further trouble, the wound was healed; excepting a small portion, somewhat more than an inch in length, and in breadth about one-tenth. This yielded no discharge, and was quite in a cicatrizing state. Five days before his admission into the infirmary, he began to complain of a tightness over his temples, and a pain in his head: in two days the hydrophobia began to appear; and at its commencement he complained of a *boiling heat* in his stomach, which was continually ascending to the fauces. The disease was pretty strong when he came to the infirmary. He got a bolus of a scruple of musk with two grains of opium; then a composition of 15 grains of musk, one of turbith mineral, and five grains of opium, was directed to be taken every third hour; an ounce of the stronger mercurial ointment was to be rubbed on the cervical vertebræ and shoulders, and an embrocation of two ounces of laudanum, and half an ounce of *acetum saturninum*, was directed to be applied to the throat. But by this last he was thrown into convulsions, and the same effect followed though his eyes were first covered with a napkin. The embrocation was therefore changed for a plaster of three drachms of powdered camphor, half an ounce of opium, and six drachms *confectio Damocritis*. By these medicines the disease seemed to be somewhat suspended, but the symptoms returned with violence in the evening. His medicine was repeated at seven; and at eight five grains of opium were exhibited without musk or turbith. At nine, another ounce of mercurial ointment was rubbed upon the shoulders, and half an ounce of laudanum with six ounces of mutton-broth was injected into the intestines, but to no purpose. A larger dose of opium was then given, but with as little effect as the former, and he died the same night.

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In the month of September 1774, a farmer, aged 25, was bit by a mad dog, whose teeth made a slight wound in the fore-finger of the left hand. He was dipped, as usual, in the sea; and drank the sea-water for some time on the spot, which operated briskly as a purge. He continued well till the 6th of June following, when he first felt a pain in that hand and arm; for which he bathed in a river that evening, supposing that it had been a rheumatic complaint. The next day he was sick; and in the evening was seized with a violent vomiting, which continued all that night and till the middle of the next day, when it was succeeded by the hydrophobia. He was treated with the warm bath; had a purgative clyster injected; and as soon as it had operated, a second was given, consisting of four ounces of oil, and half an ounce of laudanum: half an ounce of strong mercurial ointment was rubbed on the fauces, and the part was afterwards covered with the *cataplasma e cymino*. to which was added an ounce of opium. An embrocation was applied to the region of the stomach with continued friction, consisting of half an ounce of spirit of sal ammoniac, ten drachms of oil olive, six drachms of oil of amber, and ten drachms of laudanum. Two ounces of strong mercurial ointment were rubbed upon the shoulders and back; and as a further means of kindling a ptyalism speedily, he received the smoke of cinnabar into the mouth by throwing a drachm of that substance now and then upon a hot iron: he was also directed to take every four hours a bolus of 15 grains of musk, three grains of turbith mineral, and four grains of opium. He was easier while in the warm bath, and during the application of the ointment; but died the same night about two o'clock.

Many other instances might be adduced of the inefficacy of this pretended specific: the danger of acquiescing in which, will, it is hoped, create a due degree of caution in those to whom they who are so unfortunate as to be bit by a mad animal may commit themselves. Another remedy may also be mentioned as having had the reputation of being sometimes successful in this disease; which is chiefly employed in different parts of India, particularly in the territory of Tanjore. The medicine to which we now allude contains indeed several articles which are altogether unknown in our materia medica: but it contains at least one very powerful substance well known to us, viz. arsenic. This medicine, known by the name of the Snake Pills, as being principally employed against the bite of the most venomous snakes, is directed to be prepared in the following manner:

Take white arsenic, of the roots of nelli navi, of nevi visham, of the kernels of the ner valum, of pepper, of quicksilver, each an equal quantity. The quicksilver is to be rubbed with the juice of the wild cotton till the globules are perfectly extinguished. The

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The arsenic being first levigated, the other ingredients, reduced to a powder, are then to be added, and the whole beat together with the juice of the wild cotton to a consistence fit to be divided into pills.

Though these pills are principally used against the bite of the cobra de capello, yet they are said also to be successful in the cure of other venomous bites; and, for the prevention of rabies canina, one is taken every morning for some length of time. Of this remedy European practitioners have, we believe, as yet no experience; and if, in the accounts transmitted by East India practitioners, it cannot be said that we have authentic evidence of its want of success, it can as little be pretended that there is indubitable evidence of its efficacy in any instance; and it is by no means improbable, that it will be found equally inefficacious with others at one time considered as infallible.

Of the great variety of remedies which have had their day of reputation, there is not one which has not possessed the credit, some time or other, of preventing the noxious effects arising from the bite of a mad dog. A more adequate experience has with all of them discovered the deception. It was above observed, that the hydrophobia is by no means the infallible consequence of being bit by a mad animal; and that of between 20 and 30 persons who were bit by the dog which gave the fatal wound to one of Dr Vaughan's patients, not one felt the least ill effect but himself. "In the above number (says the Doctor) were some who took the Ormskirk Medicine; others went to the salt-water; and a part of them used no remedy, who yet fared equally well with the most attentive to their injury. The same thing has often happened before; and much merit, I doubt not, has been attributed to the medicine taken, from that celebrated one of *Sir George Cobb* down to the *infallible* one which my good *Lady Bountiful*'s receipt-book furnishes."

From all that has been said, the reader will judge how far the hydrophobia is capable of being subdued by any of the medicinal powers which have yet been tried. Some eminent physicians assert that it is totally incurable; and allege that the instances recorded by different authors of its cure have not been the genuine kind, but that which comes on spontaneously, and which is by no means so dangerous. Indeed two of Dr Wolf's patients recovered, where the disease seems to have been perfectly genuine: but in these the poison seemed to vent itself partly on some other place besides the nervous system. In one the blood was evidently infected, as it had an abominable fœtor; and the other had a violent pain and swelling in the belly. In all the others, it seemed to have attacked only the nervous system; which perhaps has not the same ability to throw off any offending matter as the vascular system.

There is, however, a possibility that the prodigious affections of the nerves may arise only from a vitiated state of the gastric juices; for it is well known, that the most terrible convulsions, nay the hydrophobia itself, will arise from an affection of the stomach, without any bite of a mad animal. This seems to be somewhat confirmed from one of Dr Wolf's patients, who, though he vomited more than 50 times, yet still threw up a frothy matter, which was therefore evidently secreted into the stomach, just as a continual vomiting of bilious matter shows a continual and extraordinary secretion of bile. Dr Wolf himself adopts this hypothesis so far as to say, that perhaps the *serum* may become frothy; but in blood drawn from a vein not the least fault appears either in the serum or crassamentum. He affirms, however, that the duodenum appears to be one of the parts first and principally affected; and as it is not inflamed, it would seem that the affection it sustains must arise from the vitiated state of its juices.

Be this as it will, however, in the hydrophobia, the stomach seems totally, or in a great measure, to lose the power which at other times it possesses. Two grains of *cuprum ammoniacum* were repeatedly given to a child of eight years of age without effect; but this dose would occasion violent vomiting in a strong healthy man. Something or other therefore must have prevented this substance from acting on the nervous coat of the stomach; and this we can only suppose to have been the exceedingly disordered state of the gastric juice, which occasioned such violent irritation through the whole body, that the weaker stimulus of the medicine was entirely lost. It would seem proper therefore to consider the stomach in hydrophobic cases as really containing a poisonous matter, which could not be expelled by vomiting, because it is renewed as fast as evacuated. The indication therefore must be, to change its nature by such medicines as are certainly more powerful than the poison; and this indication will naturally lead us to think of large doses of alkaline salts. These, it is certain, will destroy any animal substance with which they come in contact, and render even the poison of serpents inactive. By exhibiting a few doses of them, larger no doubt than what could be safely done on other occasions, we would be certain to change the state of the stomachic juices; and thus might free the patient from those intolerable spasms which always occasion death in such a short time. Dr Wolf seems inclined to think that volatile alkalies were of service; but the above hypothesis would incline us to use rather the fixed kind. At any rate, it seems vain for physicians to trust much to the power of opium, mercury, musk, or cinnabar, either singly or combined in any possible way. The bark has also failed, and the most celebrated specifics have been found ineffectual. Alkalies are the next most powerful remedies which the *materia medica* affords, and they cannot be more unsuccessful than the others have generally been.

Another remedy which seems adapted to change the nature of the gastric juices is ardent spirits. In one of Dr Wolf's patients two bottles of brandy seem to have effected a cure. The oil mixed with it was of no efficacy in other cases, and the opium and turbith seem not to have been exhibited till the worst was past. In this case the disease seems to have attacked the vascular as well as the nervous system.

In all the patients the warm bath seems to have been a palliative, and a very powerful one, and as such it ought never to be omitted, though we can by no means trust to it as a radical cure; and the above histories abundantly show, that though the warm bath and opium may palliate for a short time, the cause on which

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which the ſpaſms depend is ſtill going on and increaſing, till at laſt the ſymptoms become too ſtrong to be palliated even for a moment by any medicine however powerful. At any rate, the above mentioned hypotheſis ſuggeſts a new indication, which, if attended to, may perhaps lead to uſeful diſcoveries. In caſes where putreſcent bile is abundantly ſecreted, columbo root and vegetable acids are recommended to change the nature of the poiſon which the body is perpetually producing in itſelf. Where corroſive mercury hath been ſwallowed, alkaline ſalt is recommended to deſtroy the poiſon which nature cannot expel by vomiting; and why ſhould not ſomething be attempted to deſtroy the poiſon which the ſtomach ſeems to ſecrete in the hydrophobia, and which nature attempts to expel, though in vain, by violent efforts to vomit?

But whatever plan may be purſued in the hopes of curing this dreadful malady after any of the ſymptoms have made their appearance, we ought, in every inſtance of the accident that gives riſe to it, to direct our immediate care to *prevention*, as being perhaps the only real ground of hope: And the moſt certain and efficacious way of preventing the ill conſequences, is inſtantly (if it may be done) to cut out the piece in the place that happens to be bitten. Dr James, indeed, ſays, that he would have little opinion of cutting or cauteriſing, if ten minutes were ſuffered to elapſe from the receiving of the bite before the operation was performed. But in an inaugural diſſertation lately publiſhed at Edinburgh by Dr Parry, the author is of opinion that exciſion will be of uſe a conſiderable time after the bite is received. He adopts this opinion from what happens in the ſmall-pox, where the blood does not ſeem to receive the infection till ſome days after inoculation has been performed. A ſecond inflammation, he tells us, then takes place, and the infection is conveyed into the blood. In like manner, when the hydrophobous infection is about to be conveyed into the blood, according to him, the wound, or its cicatrix, begins again to be inflamed; and it is this ſecond inflammation which does all the miſchief. Exciſion, or the cautery, will therefore be effectual any time betwixt the bite and the ſecond inflammation of the wound. Without implicitly truſting to this doctrine, however, or conſidering it as in any degree aſcertained in what manner the poiſon diffuſes itſelf, by what marks its progreſs may be known, or how ſoon the ſyſtem may be irremediably tainted with its malignity, it is undoubtedly ſafeſt not to loſe unneceſſarily a moment's time in applying the knife. This, or a dilation of the wound if it be ſmall, Dr Vaughan conſiders as the only prophylactics that can be depended upon. In the latter caſe, he directs to fill the wound with gunpowder, and ſet fire to it; which would produce a laceration of the part, and poſſibly the action of ignited powder upon the poiſon may have its uſe. In all caſes, likewiſe, after theſe practices have been employed, the wound ſhould be prevented from healing for ſome length of time.

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Hydrophobia ſpontanea, *Sauv.* ſp. 2.

This diſeaſe very much reſembles the former, ſo that it has undoubtedly been often miſtaken for it. It has been known to come on from an inflammation of the

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ſtomach, where it was cured by repeated and large blood-letting; in hyſteria, where it was cured by opium, muſk, or other antiſpaſmodics; and in putrid fevers, where it was cured by evacuating the inteſtinal canal of the putrid matters by repeated clyſters. A very good method of diſtinguiſhing the two is, that in the ſpontaneous hydrophobia the patient is much more delirious than in the genuine ſpecies. In the inſtance mentioned in the Medical Eſſays of this ſymptom attending the inflammation of the ſtomach, the patient *raved in the moſt extraordinary manner.* Dr Raymond ſays he remembers a ſpontaneous hydrophobia *attended with madneſs*; and in almoſt all the caſes of hydrophobia which are ſaid to have been cured, the patient was very delirious. Dr Nugent's patient was very frequently delirious, and dreaded *dogs* as well as water. In the Medical Tranſactions a caſe is communicated by W Wrightſon ſurgeon in Sedgefield, Durham, of *canine madneſs* ſucceſsfully treated. This madneſs indeed came on after the bite of a dog ſaid to be mad: but it appeared only four days after the accident happened, and was attended with ſymptoms very unlike any of thoſe abovementioned; for he ſuddenly ſtarted up in a fit of delirium, and ran out of the houſe, and after being brought in, caught hold of the hot bars of the grate which held the fire: Whereas, in the true hydrophobia, the patients dread the fire, light, or any thing which makes a ſtrong impreſſion on the ſenſes, exceedingly. It is probable, therefore, that this was only a ſpontaneous hydrophobia, eſpecially as it readily yielded to veneſection, 30 drops of laudanum, and pills of a grain and an half of opium given every three hours, ſome boluſes of muſk and cinnabar, &c. while in ſome of the former caſes as much opium was given to a boy as would have deprived of life the ſtrongeſt healthy man had he ſwallowed it; and yet this amazing quantity produced ſcarce any effect. This patient alſo dreaded the ſight of a dog.

Order IV. VESANIÆ. 325

Paranoiæ, *Vog.* Claſs IX.
Deliria, *Sauv.* Claſs VIII. Ord. III. *Sag.* Claſs XI. Ord. III.
Ideales, *Lin.* Claſs V. Ord. I.

Genus LXV. AMENTIA. 326
Folly, or *Idiotiſm.*

Amentia, *Sauv.* gen. 233. *Vog.* 337. *Sag.* 346.
Moroſis, *Lin.* 106.
Stupiditas, Moroſis, Fatuitas, *Vog.* 336.
Amneſia, *Sauv.* gen. 237. *Sag.* 347.
Oblivio, *Lin.* 107. *Vog.* 338.
Memoriæ debilitas, *Junck.* 120.

Genus LXVI. MELANCHOLIA. 327
Melancholy *Madneſs.*

Melancholia, *Sauv.* gen. 234. *Lin.* 71. *Vog.* 332. *Sag.* 347. *Boerh.* 1089. *Junck.* 121.
Dæmonomania, *Sauv.* gen. 236. *Sag.* 348.
Dæmonia, *Lin.* 69.
Veſania, *Lin.* 70.
Paraphobia, *Lin.* 75.
Athymia, *Vog.* 329.

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Delirium melancholicum, *Hoffm.* III. 251.
Erotomania, *Lin.* 82.
Nostalgia, *Sauv.* gen. 226. *Lin.* 83. *Sag.* 338. *Junck.* 125.
Melancholia nervea, *Cl. Lorry* de melancholia, P. I.

128 GENUS LXVII. MANIA.
RAVING or FURIOUS *Madness*.

Mania, *Sauv* gen. 235. *Lin* 68. *Vog.* 331. *Sag.* 340. *Boerh.* 1118. *Junck.* 122. *Battie* on Madness.
Paraphrosyne, *Lin.* 66.
Amentia, *Lin.* 67.
Delirium maniacum, *Hoffm.* III. 251.

Although these distempers may be considered as distinct genera, yet they are so nearly allied, and so readily change into each other, that it sufficiently justifies the treating all of them together.

The distinguishing characteristic of madness, according to Dr Battie, is a *false perception*; and under this general character may be comprehended all kinds of what is called *madness*, from the most silly stupidity and idiotism to the most furious lunacy. Frequently the different kinds of madness are changed into each other by the casual excitement of some passion: thus, an idiot may become furiously mad, by being put in a violent passion; though this does not so often happen as the change of melancholy into the raving madness, and *vice versa*.

It is a very surprising circumstance, that mad people are not only less liable to be seized with infectious disorders than those who are in perfect health; but even when labouring under other diseases, if the patients chance to be seized with madness, they are sometimes freed from their former complaints. Of this kind Dr Mead relates two very remarkable instances.

On the other hand, it has been known, that an intermittent fever, supervening madness of long standing, has proved a cure for the madness; the senses having returned when the fever terminated. Dr Monro saw two instances of this himself; and mentions it as an observation of his predecessor in the care of Bethlem hospital.

Another remarkable circumstance is, that immoderate joy, long continued, as effectually disorders the mind as anxiety and grief. For it was observable in the famous South-Sea year, when so many immense fortunes were suddenly gained, and as suddenly lost, that more people had their heads turned, from the prodigious flow of unexpected riches, than from the entire loss of their whole substance.

Mad people, especially of the melancholic kind, sometimes obstinately persevere in doing things which must excite great pain: whence it should seem as if their minds were troubled with some distracting notions, which make them patiently bear the present distress, lest more severe tortures should be inflicted; or possibly they may think, that, by thus tormenting the body, they render themselves more acceptable to the divine Being, and expiate the heinous sins of which they may imagine themselves to have been guilty.

It is, however, also highly probable, that their feelings differ exceedingly from what they are in a natural state; at least they are every day observed to endure, apparently without the smallest uneasiness, watching, hunger, and cold, to an extent which in a state of health would not only be highly distressing, but to the greater part of individuals would even prove fatal. And this resistance of hunger, cold, and sleep, affords perhaps the best test for distinguishing cases of real insanity, from cases where the disease is only feigned, and appearances of it put on, to answer particular purposes; at least where this power of resistance is present, we have good reason to conclude that the affection is not feigned.

Cure. Although we be well acquainted with many of the remote causes of this disease, some of the principal of which have already been mentioned, yet we are still so ignorant of the influence of these upon the system, as giving a derangement of the mental faculties, that no general principles on which the cure may be conducted, can with any confidence be pointed out.

It may, however, be observed, that while some remedies seem to operate by producing an artificial termination of this complaint, many others have effect only as aiding a natural termination. And where a recovery from this disease does take place, it most frequently happens in consequence of a natural convalescence. All the species and degrees of madness which are hereditary, or that grow up with people from their early youth, are out of the power of physic; and so, for the most part, are all maniacal cases of more than one year's standing, let them arise from what source soever. Very often mere debility, the dregs of some particular disease, such as an ague, the small-pox, or a nervous fever, shall occasion different degrees of foolishness or madness. In these cases, the cure must not be attempted by evacuations; but, on the contrary, by nourishing diet, clear air, moderate exercise, and the use of wine: whereas, in almost all the other maniacal cases, which arise from different sources, and which come on in consequence of intemperate living, violent passions, or intense thinking, it is generally held, that evacuations of every kind are necessary, unless the constitution of the patient be such as absolutely forbids them.

Blood is most conveniently drawn either from the arm or jugulars; and if the weakness be such as renders it improper to take away much blood, we may apply cupping-glasses to the occiput.

Vomiting, in weakly people, must be excited by the vinum ipecacuanæ; but in the more robust by emetic tartar or antimonial wine: the most efficacious cathartics are the infusion or tincture of black hellebore, or infusion of sena quickened with tincture of jalap; but if there be suppression of the menses, or hæmorrhoidal discharge, then aloetic purges will be more proper; and in some instances cooling saline purgatives, such as lixiviated tartar, are of great service. In general, mad people require very large doses, both of the emetics and cathartics, before any considerable operation ensues.

Dr Monro assures us, that the evacuation by vomiting is infinitely preferable to any other: the prodigious quantity of phlegm with which the patients in this disease abound, he says, is not to be got the better of but by repeated emetics; and he observes, that the purges have not their right effect, or do not operate to so good purpose, until the phlegm be broken and

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and attenuated by frequent emetics. He mentions the cafe of a gentleman who had laboured under a melancholy for three years, from which he was relieved entirely by the ufe of vomits and a proper regimen. Increafing the difcharge by urine, is alfo of the greateft moment, efpecially when any degree of fever is prefent. The cutaneous difcharges are alfo to be promoted; for which purpofe the hot bath is of the higheft fervice in maniacal cafes. Hoffman afferts, that he has feen numerous inftances, both of inveterate melancholy and raging madnefs, happily cured by means of warm bathing; bleeding and nitrous medicines having been premifed. Camphor has alfo been highly commended; but, if we can believe Dr Locker of Vienna, not very defervedly. Having found very good effects from a folution of this medicine in vinegar, he took it for granted that all the fuccefs was owing to the camphor; therefore, in order to give it a fair trial, he felected feven patients, and gave it in large dofes of half a drachm twice a-day. This was continued for two months, and the doctor was furprifed to find that only one of his patients received any benefit. He then returned the other fix back to the camphorated julep made with vinegar, and in a few weeks four of them recovered the ufe of their reafon. This inclined him to think that the virtue depended folely on the vinegar, and accordingly he began to make the trial. Common vinegar was firft given: but after a little while he fixed on that which had been diftilled, and gave about an ounce and half of it every day; the patients having been previoufly prepared by bleeding and purging, which was repeated according as it was found neceffary. He gives a lift of eight patients who were cured by this method; fome in fix weeks, others in two months, and none of them took up more than three months in perfecting the cure. He does not indeed give the ages of the patients, nor mention the circumftances of the cafe; he only mentions the day on which the ufe of the vinegar was begun and the day on which they were difcharged; and he adds, that they all continued well at the time of his writing.

Dr Locker informs us, that this medicine acts chiefly as a fudorific; and he obferved, that the more the patients fweated, the fooner they were cured: it was alfo found to promote the menftrual difcharge in fuch as had been obftructed, or had too little of this falutary evacuation.

Both reafon and experience fhow the neceffity of confining fuch as are deprived of their fenfes; and no fmall fhare of the management confifts in hindering them to hurt themfelves or do mifchief to other perfons. It has fometimes been ufual to chain and to beat them: but this is both cruel and abfurd; fince the contrivance called the *ftrait waiftcoat* anfwers every purpofe of reftraining the patients without hurting them.

Thefe waiftcoats are made of ticken, or fome fuch ftrong ftuff; are open at the back, and laced on like a pair of ftays; the fleeves are made tight, and long enough to cover the ends of the fingers, where they are drawn clofe with a ftring like a purfe, by which contrivance the patient has no power of his fingers; and, when laid on his back in bed, and the arms brought acrofs the cheft, and faftened in that pofition by tying the fleeve-ftrings round the waift, he has no ufe of his hands. A broad ftrap of girth-web is then carried acrofs the breaft, and faftened to the bedftead, by which means the patient is confined on his back; and if he fhould be fo outrageous as to require further reftraint, the legs are fecured by ligatures to the foot of the bed; or they may be fecured by being both put into one bag not very wide, which may be more eafily fixed than the feet themfelves, at leaft without giving pain.

It is of great ufe in practice to bear in mind, that all mad people are cowardly, and can be awed even by the menacing look of a very expreffive countenance; and when thofe who have charge of them once imprefs them with the notion of fear, they eafily fubmit to any thing that is required. The phyfician, however, fhould never deceive them in any thing, but more efpecially with regard to their diftemper: for as they are generally confcious of it themfelves, they acquire a kind of reverence for thofe who know it; and by letting them fee that he is thoroughly acquainted with their complaint, he may very often gain fuch an afcendant over them that they will readily follow his directions.

It is a more difficult matter to manage thofe whofe madnefs is accompanied either with exceffive joy or with great dejection and defpondency, than thofe who are agitated with rage: and all that can be done is to endeavour to excite contrary ideas, by repreffing the immoderate fits of laughter in the one kind by chiding or threatening (taking care, however, not abfolutely to terrify them, which can never be done without danger, and has often added to the mifery of the unhappy fufferer); and difpelling the gloomy thoughts in the other, by introducing pleafing concerts of mufic, or any other fpecies of entertainment which the patients have been known to delight in while they had the ufe of their reafon.

Though bliftering the head has generally been directed, Dr Mead fays he has oftener found it to do harm than fervice: but he recommends iffues in the back; and advifes to keep the head always clofe fhaved, and to wafh it from time to time with warm vinegar. Opium has by many been forbidden in maniacal cafes, as fuppofing that it always increafes the difturbance; but there are inftances where large dofes of this medicine have been found to prove a cure, and perhaps if it were tried oftener we fhould find powerful effects from it: there certainly cannot much harm enfue from a few dofes, which may be immediately difufed if they fhould be found to exafperate the difeafe.

The diet of maniacal patients ought to be perfectly light and thin: their meals fhould be moderate; but they fhould never be fuffered to live too low, efpecially while they are under a courfe of phyfic: they fhould be obliged to obferve great regularity in their hours: even their amufements fhould be fuch as are beft fuited to their difpofition; and after the difeafe appears to be fubdued, chalybeate waters and the cold bath will be highly proper to ftrengthen their whole frame and fecure them againft a relapfe.

GENUS

Vefaniæ.

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Genus LXVIII. ONEIRODYNIA.
Uneasiness in Sleep.

Somnium, *Vog.* 339.
Somnambulifmus, *Sauv.* gen. 221. *Lin.* 77. *Sag.* 333
Hypnobatafis, *Vog.* 340.
Noctambulatio, *Junck.* 124.
Ephialtes, *Sauv.* gen. 138. *Lin.* 163. *Sag.* 245.
Incubus, *Vog* 221. *Junck.* 50.

The greateft uneafinefs which people feel in fleep is that commonly called the *incubus* or *night-mare*. Thofe feized with it feem to have a weight on their breafts and about their præcordia. Sometimes they imagine they fee fpectres of various kinds which opprefs or threaten them with fuffocation. Neither does this uneafinefs continue only while they are afleep; for it is fome time after they awake before they can turn themfelves in their beds or fpeak; nay, fometimes, though rarely, the diftemper has proved mortal.—The incubus rarely feizes people except when the ftomach is oppreffed with aliments of hard digeftion, and the patient lies on his back. It is to be cured by eating light fuppers, and raifing the head high; or, if it become very troublefome, antifpafmodic medicines are to be adminiftered, and the body ftrengthened by chalybeates. The fame method is to be followed by thofe who are fubject to walking in their fleep; a practice which muft neceffarily be attended with the greateft danger: and fomnambulifm may juftly be confidered as merely a different modification of this difeafe. Accordingly Dr Cullen has diftinguifhed the one by the title of *oneirodynia activa*, and the other by that of *oneirodynia gravans*.

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CLASS III. CACHEXIÆ.

Cachexiæ, *Sauv.* Clafs X. *Sag.* Clafs VIII. *Sag.* Clafs III
Deformes, *Lin.* Clafs X.

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Order I. MARCORES.

Macies, *Sauv.* Clafs X. Order I. *Sag.* Clafs III. Order I.
Emaciantes, *Lin.* Clafs X. Order I.

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Genus LXIX. TABES.
Wasting of the *Body*.

Tabes, *Sauv.* gen. 275. *Lin.* 209. *Vog.* 306. *Sag.* 100.

This diforder is occafioned by the abforption of pus from fome ulcer external or internal, which produces an hectic fever. The primary indication therefore muft be to heal the ulcer, and thus take away the caufe of the difeafe. If the ulcer cannot be healed, the patient will certainly die in an emaciated ftate. But the proper treatment of the tabes proceeding from this caufe, falls to be confidered under the head of *Ulcer* in Surgery, and likewife under the genera Siphylis, Scrofula, Scorbutics, &c. difeafes in which ulcers are leaft a very common fymptom.

Atrophia.

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Genus LXX. ATROPHIA.
Nervous Consumption.

Defcription. This affection confifts principally in a wafting of the body, without any remarkable fever, cough, or difficulty of breathing; but attended with want of appetite and a bad digeftion, whence the whole body grows languid, and waftes by degrees.—Dr Cullen, however, afferts, that fome degree of fever, or at leaft of increafed quicknefs of the pulfe, always attends this difeafe.

Caufes. Sometimes this diftemper will come on without any evident caufe. Sometimes it will arife from paffions of the mind; from an abufe of fpirituous liquors; from exceffive evacuations, efpecially of the femen, in which cafe the diftemper hath got the name of *tabes dorfalis*. It may arife from mere old age, or from famine.

Prognofis. This diftemper, from whatever caufe it may arife, is very difficult to cure, and often terminates in a fatal dropfy.

Cure. The general principles on which the treatment of this difeafe is to be regulated, very much depend on the caufe by which it is induced; and it is unneceffary to add, that this muft be removed as far as poffible. Next to this, the difeafe is moft effectually combated by the introduction of nutritious aliment into the fyftem, and by obtaining the proper affimilation and digeftion of this. With the firft of thefe intentions, recourfe muft be had to the diet that is moft nutritious, and at the fame time of eafieft digeftion. But from the condition of the ftomach commonly attending this difeafe, it is neceffary fmall quantities only fhould be taken at a time, and that it fhould be frequently repeated. With the fecond intention, ftomachic and nervous medicines are the articles chiefly at leaft to be depended upon in this cafe. The Peruvian bark, elixir of vitriol, and chalybeates, are excellent; and thefe fhould be conjoined with gentle exercife, as far as the ftrength and other circumftances of the patient will admit. In that fpecies of the diftemper occafioned by venereal exceffes, it is fo effentially neceffary to abftain from them, that without it the beft remedies will prove altogether ufelefs. But this is fo feldom complied with, that the tabes dorfalis almoft always proves mortal.

Order II. INTUMESCENTIÆ. 334

Intumefcentiæ, *Sauv.* Clafs X. Ord. II. *Sag.* Clafs III. Ord II.
Tumidofi, *Lin.* Clafs X. Ord. II.

Genus LXXI. POLYSARCIA. 335
Corpulency.

Polyfarcia, *Sauv.* gen. 279. *Lin.* 213. *Vog.* 540. *Sag.* 160. Steatites, *Vog.* 390.

In a natural and healthy ftate, the fat, or animal oil, is not allowed to diffufe itfelf throughout the cellular interftices at large, but is confined to the places where fuch an oily fluid is neceffary, by a particular apparatus of diftinct veficles. But in fome conftitutions the oily part of the blood appears to exceed the requifite proportion, and eafily feparates from the other con-

Intumescentiæ

constituent parts; or there is an uncommon tendency to the separation of oily matter. In these cases it is apt to accumulate in such quantities, that we may suppose it to burst those vesicles which were originally destined to hinder it from spreading too far; or almost every cell of the membrana adiposa, many of which are in ordinary cases altogether empty, may be completely filled with fat.

The increase of the omentum particularly, and the accumulation of fat about the kidneys and mesentery, swell the abdomen, and obstruct the motions of the diaphragm; whence one reason of the difficulty of breathing which is peculiar to corpulent people; while the heart, and the large vessels connected therewith, are in like manner so encumbered, that neither the systaltic nor subsultory motion can be performed with sufficient freedom, whence weakness and slowness of the pulse: but when the whole habit is in a manner overwhelmed with an oily fluid, the enlargement of the cellular interstices will necessarily interrupt the general distribution and circulation throughout the nervous and vascular systems; impeding the action of the muscular fibres, and producing insensibility, somnolency, and death.

These cases are the more deplorable, as there is but little prospect of a cure. For the animal oil is of too gross a nature to be easily taken up by absorption; and we know, that when fluids are accumulated in the cellular system, there are only two ways in which they can be carried off or escape; namely, by the absorbents, which take their rise from the cellular interstices, and through the pores of the skin by transudation.

Another misfortune is, that the disease steals on so imperceptibly, that it becomes inveterate before people begin to think of pursuing the proper means of relief.

In this disease the cure must turn upon two points: First, on preventing the farther deposition of fat, by avoiding the introduction of superfluous aliment, particularly of fatty matters, into the system; and, secondly, on promoting and forwarding the absorption of fat. On these grounds, besides what may be done by proper regimen, a variety of articles have been recommended in the way of medicine.

Soap has been proposed as a remedy to melt down and facilitate the absorption of the fat in corpulent people; and Dr Fleming some years ago published a little treatise, wherein he recommends this medicine, and relates the case of a gentleman who is said to have received considerable benefit from it. But perhaps the soap-leys would be more powerful, and might be more easily taken, sheathed, as directed when recommended as a dissolvent of the stone.

Lieutaud advises to take *acetum scilliticum* in small doses, with frequent purging and brisk exercise. But it will seldom happen that the patients will be found sufficiently steady to persist in any of these courses, it being the nature of the disorder to render them irresolute and inattentive to their condition. Therefore the principal use of rules must be with a view to prevention; and persons who are disposed to corpulency should take care in time to prevent it from becoming an absolute disease, by using a great deal of exercise, not indulging in sleep, and abridging their meals, especially that of supper. Salted meats are less fattening than such as are fresh; and drinking freely of coffee is recommended to corpulent people.

Polysarcia.

But Dr Fothergill observes, that a strict adherence to vegetable diet reduces exuberant fat more certainly than any other means that he knows; and gives two cases wherein this regimen succeeded remarkably well. The famous Dr Cheyne brought himself down in this way, from a most unwieldy bulk to a reasonable degree of weight; as he himself informs us. It deserves, however, to be remarked, that every practice for the removal or prevention of fatness must be used with great caution and prudence: for not a few, anxious to prevent this affection, have had recourse to a regimen and to medicine which have proved fatal. This has particularly arisen from the excessive use of acids, probably operating by entirely destroying the action of the chylopoietic viscera.

GENUS LXXII. PNEUMATOSIS. 336
EMPHYSEMA, or *Windy Swelling*.

Pneumatosis, *Sauv.* gen. 280. *Vog.* 391. *Sag.* 107.
Emphysema, *Sauv.* gen. 13. *Lin.* 268. *Vog.* 392.
Leucophlegmatia, *Lin.* 214.

The emphysema sometimes comes on spontaneously; but more frequently is occasioned by wounds of the lungs, which, giving vent to the air, that fluid insinuates itself into the cellular texture, and often blows it up to a surprising degree. It must be observed, however, that it is only in cases of laceration of the lungs where this disease can take place; for in a simple wound, the effusion of blood always prevents the air from getting out. The cure is to be accomplished by scarifications and compresses; but in some cases only by the paracentesis of the thorax. When air introduced from the lungs is collected in a considerable quantity in the cavity of the thorax, the operation of the paracentesis is perhaps the only means of cure. Upon an opening being thus made, the air sometimes rushes out with incredible violence; and the patient receives at least immediate relief from circumstances the most distressing imaginable. In some instances it is followed even by a complete cure.

GENUS LXXIII TYMPANITES. 337
TYMPANY.

Tympanites, *Sauv.* gen 291. *Lin.* 219. *Vog.* 316. *Sag.* 118. *Boerh* 226. *Junck.* 87.
Affectio tympanitica, *Hoffm.* III. 339.
Meteorismus, *Sauv.* gen. 292.

This is an inflation of the abdomen, and is of two kinds: 1. That in which the flatus is contained in the intestines, in which the patient has frequent explosions of wind, with a swelling of the belly frequently unequal. 2. When the flatus is contained in the cavity of the abdomen; in which case the swelling is more equal, and the belly sounds when struck, without any considerable emission of flatus. Of these two, however, the former disease is by much the most common; insomuch, that many, even extensively engaged in practice, have never met with an instance of true abdominal tympanites. In both cases the rest of the body falls away.

Causes,

Tympanites.

Causes, &c. The tympany sometimes takes place in those who have been long troubled with flatulencies in the stomach and intestines. It happens frequently to women after abortion; to both sexes after the suppression of the hæmorrhoids; and sometimes from tedious febrile disorders injudiciously treated.

Prognosis. This disease is generally very obstinate, and for the most part proves fatal by degenerating into an ascites. Sometimes, if the patient be healthy and strong, the disease may terminate favourably, and that the more readily if it has followed from some disorder. A hectic consumption, dry cough, and emaciated countenance in a tympany, with a swelling of the feet, denote approaching death in a very short time.

Cure. With a view to the prevention of this affection; it is necessary, in the first place, to avoid, as far as it can be done, causes giving rise to an uncommon extrication of air, by preserving the proper tone of the alimentary canal. After this affection has taken place, the indications are, first, to expel the air already extricated and confined in different cavities; and, secondly, to prevent further accumulation. On these grounds different remedies are employed. The cure, however, is principally attempted by carminative, resolvent, and stomachic medicines, gentle laxatives, and at last tonics, especially chalybeates. In the Edinburgh Medical Essays, Vol. I. we have a very remarkable history of a tympany by Dr Monro senior. The patient was a young woman of 22 years of age, who fell into the distemper after having a tertian ague, in which she was badly treated. She became a patient in the Edinburgh Infirmary the 24th of March 1730; took several purgatives; and some doses of calomel; used the warm bath; and had an antihysteric plaster applied over the whole belly, but with very little effect. She was monstrously distended, insomuch that the skin seemed to be in danger of bursting: her breathing was much straitened; but the swelling sometimes gradually decreased without any evacuation. The returns and degree of this swelling were very uncertain; and when the belly was most detumefied, several unequal and protuberant balls could be felt over the whole abdomen, but especially at its sides. Her stomach was good, she had no thirst, and her urine was in proportion to the quantity she drank. She was very costive, had her menses at irregular periods, but no œdematous swellings appeared in the feet or any where else. In this situation she continued from the time of her admission till the 21st of June, during which interval she had only her menses twice. Throughout this space of time, the following circumstances were observed, 1. Several times, upon the falling of the swelling, she complained of a headach; once of pains throughout all her body, once of a giddiness, twice of a nausea and vomiting, and the last time threw up green bile; and once her stomach swelled greatly, whilst the rest of the abdomen subsided. 2. During the flowing of the menses she did not swell, but became very big upon their stopping. 3. Blood-letting and emetics, which were made use of for some accidental urgent symptoms, had no very sensible effect in making the tympany either better or worse. 4. She never had passage of wind either way, except a little belching some days before the first monthly evacuation.

Some time before the last eruption of the menses, the purgatives were given more sparingly; and antihysterics of the strongest kinds, such as asafœtida, oleum corn. cerv. &c. mixed with soap, were given in large doses, accompanied with the hotter antiscorbutics as they are called, as horse-radish and ginger-root infused in strong-ale with steel. The patient was ordered to use frequent and strong frictions to all the trunk of her body and extremities, and to use moderate exercise. Immediately before the menstrua began to flow, clysters of the same kind of medicines were injected. The menses were in sufficient quantity; but as soon as they ceased, her belly increased in its circumference four inches and a half, but soon subsided. She then complained of pains, which a gentle sweat carried off. Borborygmi were for the first time observed on the same day, June 25th; and having taken some *tinctura sacra* at night, she passed a small quantity of blood next day by stool. This was the first appearance of the return of the hæmorrhoids, to which she had been formerly subject

The two following days her saponaceous, antihysteric, and antiscorbutic medicines being still continued, she had such explosions of wind upwards and downwards, that none of the other patients would remain in the same room, nay scarce on the same floor with her. Her belly became less and softer than it had been from the first attack of the disease; her medicines, with a dose of syrup of buckthorn at proper intervals, still were continued, only the proportion of steel was increased; her flatulent discharge went on successfully, and she gradually recovered her former health.

Genus LXXIV. PHYSOMETRA. 338
Windy Swelling of the Uterus.

Physometra, *Sauv.* gen. 290. *Sag.* 119.
Hysterophyse, *Vog.* 317.

The treatment of this is not different from that of the tympany. It is however, upon the whole, a very rare disease; and when it takes place, very seldom if ever admits of a cure.

Genus LXXV. ANASARCA. 339
Watery Swelling over the Whole Body.

Anasarca, *Sauv.* gen. 281. *Lin.* 215. *Vog.* 313. *Sag.* 108. *Boerh.* 1225. *Hoffm.* III. 322. *Junck.* 87. *Monro* on the Dropsy. *Millman* Animadversiones de hydrope 1779.
Phlegmatia, *Sauv.* gen. 282.
Angina aquosa, *Boerh.* 791.

In this disease the feet first begin to swell, especially in the evening, after exercise, and when the patient has stood or sat long; which swelling rises frequently to the thighs. By lying in bed, the swelling becomes less, or even almost disappears. In the progress of the disease, the swelling often rises to the hips, loins, and belly, and at last covers the whole body. This disease, besides the other symptoms afterwards mentioned under Ascites, is attended with a remarkable

Intumescentiæ able difficulty of breathing. In the cure of this, as well as other species of dropsy, the general intentions are, first, the evacuation of the water already effused either by natural or artificial outlets; and, secondly, the prevention of it from accumulation, which is chiefly to be expected from supporting a due action of the absorbents, and from keeping up a proper discharge by the serous excretories.

The remedies employed with these intentions are much the same with what are employed against the more important genus of ascites. Only it may be here noticed, that in anasarca it is usual to scarify the feet and legs. By this means the water is often discharged: but the operator must be cautious not to make the incision too deep; they ought barely to penetrate through the skin; and especial care must be taken, by spirituous fomentations and proper digestives, to prevent a gangrene. Dr Fothergill observes, that the safest and most efficacious way of making these drains is by the instrument used for cupping, called a *scarificator*; and he always orders it to be so applied as to make the little wounds transversely; as they not only discharge better, but are also longer in healing, than when made longitudinally.

Notwithstanding every precaution, however, gangrene will often ensue; and it is upon the whole a much safer practice to evacuate the water by the natural outlets, the valvular lymphatic absorbents; and with this intention emetics and cathartics, but particularly diuretics, are often employed with success.

340 GENUS LXXVI. HYDROCEPHALUS.
WATER in the HEAD.

Hydrocephalus, *Sauv.* gen. 285. *Lin.* 216. *Boerh.* 1217.
Hydrocephalum, *Vog.* 384.

THIS differs from the hydrocephalus formerly treated of at some length under the title of Apoplexia Hydrocephalica, chiefly in the water being collected in the external parts of the head, whereas the former is entirely within the skull. In the fifth volume of the Medical Observations we have an account of a very extraordinary case of this kind. The patient was a child only of a few days old, and had a tumor on his head about the size of a common tea-cup, which had the appearance of a bladder distended with water; near the apex was a small opening, through which a bloody serum was discharged. In other respects the child was healthy. No application was used but a piece of linen dipt in brandy. The tumor continued to increase for many months; at the end of which time the membrane containing the water appeared equally thick with the other part of the scalp, except one place about the size of a shilling, which continued thin, and at times appeared as if it would burst. He continued in this situation for about 17 months, when the circumference of the head was 20 inches, the base $16\frac{1}{2}$, the middle $18\frac{1}{2}$, and from the base to the apex near $8\frac{1}{2}$. The water was then drawn off, and the child died in two days. Almost all other cases of this distemper have proved fatal; the sutures of the skull generally give way, and the whole external part of the head is equally enlarged: but in the instance just now given there was a deficiency of part of the bones. Although, however, in some instances where the head is thus enlarged to an enormous size, the water is exterior to the brain, and therefore intitled to the appellation of hydrocephalus exterior, yet much more frequently in those instances where there is a manifest separation of the bones of the cranium at the sutures, the water is still contained within the ventricles; and accordingly the disease may be much more properly distinguished into the *acute* and *chronic* hydrocephalus, than as is commonly done into the *internal* and *external*. Although the latter be much slower in its progress, sometimes subsisting even for years, yet it is equally difficult of cure with the former, and very often it proves fatal in a few days if the water be drawn off by an artificial opening, which may be very easily performed by a mere puncture with a common lancet, without either pain or any immediate hazard from the operation itself, although the water be lodged in the ventricles; for these are distended to an enormous size, and the substance of the brain almost totally destroyed, so that hardly any thing is to be punctured but membranes. Hydrocephalus.

GENUS LXXVII. HYDRORACHITIS. 341
SPINA BIFIDA.

Hydrorachitis, *Sauv.* gen. 287. *Morgagn.* de sed. XII. 9. *et seq.*
Spinola, *Lin* 289.
Spina bifida, *Vog.* 386.

This disease, which consists in a soft tumor on the lumbar vertebræ, attended with a separation of the vertebræ themselves, though generally considered as approaching to the nature of rachitis, is commonly referred to the article SURGERY, which may be consulted with regard to this affection.

GENUS LXXVIII. HYDROTHORAX. 342
DROPSY of the BREAST.

Hydrothorax, *Sauv.* gen. 150. *Vog.* 311. *Boerh.* 1219.

This affection, particularly with respect to its causes, is in many circumstances similar to other kinds of dropsy, particularly to ascites. But from the situation of the water which is here deposited in the cavity of the thorax, it may naturally be supposed that some peculiar symptoms will occur. Besides the common symptoms of dropsy, paleness of the countenance, scarcity of urine, and the like, this disease is, in some instances, attended with a fluctuation of water within the breast; which when it does occur may be considered as a certain distinguishing mark of this affection. But besides this, it is also distinguished by the remarkable affections of circulation and respiration with which it is attended.

The breathing is peculiarly difficult, especially in a recumbent posture; and in many instances patients cannot breath with tolerable ease, unless when sitting erect, or even stooping somewhat forwards. The pulse is very irregular, and has often remarkable intermissions. But the disease has been thought to be principally characterized by a sudden starting from sleep, in consequence of an almost inexpressible uneasy sensation

Intumescentiæ referred to the breaſt, and attended with ſtrong palpitation, which may probably ariſe from an affection either of circulation or of reſpiration.

That theſe ſymptoms are common attendants of this diſeaſe, is undeniable; and they are certainly the beſt characteriſtics of this affection with which we are yet acquainted: but it muſt be allowed that they are preſent in ſome caſes where there is no water in the breaſt; and that in other inſtances where the diſeaſe exiſts, they are either altogether wanting, or occur only to a very ſlight degree. Certain diagnoſtics, therefore, of this diſeaſe ſtill remain to be diſcovered.

When hydrothorax is preſent from the affection of the vital functions with which it is attended, it may readily be concluded that it is a dangerous diſeaſe, and in many inſtances it proves fatal. The cure, as far as it can be accompliſhed, is obtained very much on the ſame principles as in other dropſies. Here, however, probably from the uncertainty of the diagnoſtics, the artificial abſtraction of water, by paracenteſis of the thorax, is leſs frequently had recourſe to than in aſcites; though in ſome inſtances, after other means have failed, it has been ſaid not only to give relief of ſymptoms highly urgent, particularly dyſpnœa, but even to produce a complete cure. Benefit is often obtained from an artificial diſcharge of water by the application of bliſters to the breaſt: but in this, as well as other dropſies, a diſcharge is chiefly effected by the natural outlets, particularly from the uſe of cathartics and diuretics. In this ſpecies of dropſy, more perhaps than in any other, recourſe has been had to the uſe of the digitalis purpurea, or fox-glove, ſo ſtrongly recommended as a diuretic by Dr Withering in his Treatiſe reſpecting the uſe of it. There can be no doubt that this article, tho' ſometimes productive of inconvenience from the diſtreſſing ſickneſs and ſevere vomiting which it not unfrequently excites though uſed even but in ſmall doſes, often operates as a powerful diuretic, and produces a complete evacuation of water, after other articles have failed. From the effects mentioned above, however, as well as from its influence on the pulſe, which it renders much ſlower, it is neceſſary that it ſhould be employed with great caution and in ſmall doſes. A dram of the dried leaves of the digitalis, macerated for four hours in half a pint of warm water, forms an infuſion which may be given in doſes of an ounce, and the dried powder of the leaves in doſes of one or two grains: theſe doſes may be gradually increaſed, and repeated twice or oftener in the day; but this requires to be done with great caution, leſt ſevere vomiting, or other diſtreſſing ſymptoms, ſhould take place.

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Genus LXXIX. ASCITES.
Dropsy of the Abdomen.

Aſcites, *Sauv.* gen. 288. *Lin.* 217. *Vog.* 314. *Sag.* gen. 115. *Boerh.* 1226. *Hoffm.* III. 322. *Junck.* 87. *D. Monro* on the Dropſy, 1765. *Milman*, Animadverſiones de Hydrope, 1779.

Deſcription. This diſeaſe aſſumes three different forms: 1. When the water immediately waſhes the inteſtines 2. When it is interpoſed between the abdominal muſcles and peritonæum; or, 3. When it is contained in facs and hollow veſicles; in which caſe it is called the *encyſted dropſy*. Some phyſicians of great reputation have aſſerted, that the water was often placed within the duplicature of the peritonæum: but this is alleged by Dr Milman to be a miſtake, as that membrane is looked upon by the beſt anatomiſts to be ſingle; and he thinks that the abovementioned phyſicians have been led into this error from obſerving the water collected in the cellular ſubſtance of the peritonæum. Aſcites.

In the beginning of an aſcites the patient becomes languid, breathleſs, and has an averſion at motion: his belly ſwells; and when ſtruck, the ſound of fluctuating water is perceptible; there is a difficulty of breathing when the belly is preſſed. There is an almoſt continual thirſt, which in the progreſs of the diſeaſe becomes very urgent; the urine is thick, in ſmall quantity, and red. The pulſe is ſmall and frequent; and as the belly ſwells, the other parts waſte away. A fever at laſt ariſes, which, conſtantly increaſing, in the end carries off the patient. Theſe ſymptoms are moſt urgent where the waters are in immediate contact with the inteſtines; in the other kinds the reſt of the body is leſs waſted; nor is there ſo great thirſt or difficulty of breathing.

Cauſes, &c. The immediate cauſe of dropſy is a greater effuſion of ſerum by the exhalant arteries than the abſorbents take up. This may be occaſioned either by too great a quantity of liquid thrown out by the former, or by an inability of the latter to perform their office. This commonly happens in people whoſe bodies are of a weak and lax texture, and hence women are more ſubject to this malady than men; chlorotic girls eſpecially are very apt to become dropſical.

Sometimes, however, this diſeaſe is occaſioned by a debility of the vital powers, by great evacuations of blood, or by acute diſeaſes accidentally protracted beyond their uſual period; and although this cauſe ſeems very different from a laxity of fibres, yet the dropſy ſeems to be produced in a ſimilar manner by both. For the vital powers being debilitated by either of theſe cauſes, naturally bring on a certain debility and laxity of the ſolids; and on the other hand a debility of the ſolids always brings on a debility of the vital powers; and from this debility of the vital powers in both caſes it happens, that thoſe humours which ought to be expelled from the body are not, but accumulate by degrees in its cavities. There is, however, this difference between the two kinds of dropſy ariſing from theſe two different cauſes, That in the one which ariſes from laxity the ſolid parts are more injured than in that which ariſes from a debility of the vital powers. In the former, therefore, the water ſeems to flow out from every quarter, and the body ſwells all over. But when the diſeaſe is occaſioned by a debility of the vital powers, though the ſolids be leſs damaged, yet the power of the heart being much diminiſhed, and the humours ſcarce propelled through the extreme veſſels, the thin liquids, by which in a healthy ſtate the body is daily recruited, are carried by their own weight either into the cavities or into the cellular texture. Hence thoſe aqueous effuſions which follow great evacuations of blood, or vio-

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lent loosenesses, begin in the more depending parts of the body, gradually ascending, till they arrive at the cavity of the abdomen, or even the thorax.

But another and much more sufficient cause for the production of dropsy is an obstruction of the circulation; and this may take place from polypi in the heart or large vessels, and hard swellings in the abdomen. Instances have been observed of a dropsy arising from steatomatous tumors in the omentum, and many more from a scirrhous liver or spleen, and from an infarction and obstruction of the mysenteric glands, by which means the lymph coming from the extremities is prevented from arriving at the heart. Scirrhosity of the liver, the most common cause of ascites, probably operates by augmenting effusion in consequence of its preventing the return of the venous blood, the greater part of the veins from the abdomen going to the formation of the vena portarum.

Lastly, whatever, either within or without the vessels, contracts or shuts up their cavities, produces a more copious and easy transmission of the thin humours through the exhalant arteries, at the same time that it prevents their return by the absorbent veins. This has been established by experiment. For Lower having perforated the right side of the thorax in a dog, tied the *vena cava*, and sewed up the wound. The animal languished for a few hours, and then died. On dissection, a great quantity of serum was found in the abdomen, as if he had long laboured under an ascites. In like manner, having tied the jugular veins of another dog, a surprising swelling took place in those parts above the ligatures, and in two days the creature died. On dissection, all the muscles and glands were vastly distended, and quite pellucid, with limpid serum. From these experiments, and some cases of the disease mentioned by different authors, it appears, that when the veins are obstructed so that they cannot receive the arterial blood, the serum is separated as by a filtre into the more open cavities and laxer parts of the body, while the thicker part stagnates and is collected in the proper blood-vessels.

The too great tenuity of the humours is very frequently accused as the cause of dropsy, and many authors have asserted that dropsy might arise merely from a suberabundance of water in the blood. For this some experiments are quoted, from which they would infer, that when a great quantity of aqueous fluid is introduced into the blood, the superfluous fluid ought by no means to pass through the extremities of the sanguiferous arteries into the veins in the common course of circulation, but by being effused into the cavities should produce a dropsy. But this can only happen when the vital powers are very much diminished; for, in a natural state, the superfluous quantity is immediately thrown out by the skin or the kidneys: and agreeable to this we have an experiment of Schultzius, who induced a dropsy in a dog by causing him drink a great quantity of water; but he had first bled him almost *ad deliquium*, so that the vital powers were in a manner oppressed by the deluge of water. In this manner do those become hydropic who are seized with the disease on drinking large quantities of water either when wearied with labour, or weakened by some kinds of diseases. Dr Fothergill relates an instance of a person who, being advised to drink plentifully of barley-water, in order to remove a fever, rashly drunk 12 pounds of that liquor every day for a month, and thus fell into an almost incurable distemper. But if this quantity had been taken only during the prevalence of the fever, he would in all probability have suffered no inconvenience, as is probable from what has been related concerning the *diæta aquea* used by the Italians.

It is moreover evident from experiments, that, in a healthy state, not only water is not deposited in the cavities, but that if it is injected into them it will be absorbed, unless some laxity of the solids has already taken place. Dr Musgrave injected into the right side of the thorax of a dog four ounces of warm water; whence a difficulty of breathing and weakness immediately followed. But these symptoms continually lessened, and in the space of a week the animal seemed to be in as good health as before. Afterwards he injected 16 ounces of warm water into the left cavity of the thorax in the same dog; the same effects followed, together with great heat, and strong pulsation of the heart; but he again recovered in the space of a week. Lastly, he injected 18 ounces of water into one side of the thorax, and only six into the other: the same symptoms followed, but vanished in a much shorter time; for within five days the dog was restored to perfect health. During this time, however, he observed that the creature made a greater quantity of urine than usual.

The remote causes of dropsy are many and various. Whatever relaxes the solids in such a manner as to give an occasion of accumulation to the serous fluids, disposes to the dropsy. A lazy indolent life, rainy wet weather, swampy or low soil, and every thing which conduces to vitiate the viscera, or insensibly to produce obstructions in them, paves the way for a dropsy. Hence those are ready to fall into the disease who use hard and viscid aliments, such as poor people in some countries who use coarse brown bread, and children who are fed with unwholesome aliments; and the same thing happens to those who drink immoderately of spirituous liquors.

Prognosis. When the dropsy arises from a scirrhus of the liver or spleen, or any of the other viscera, the prognosis must always be unfavourable, and also when it arises from disorders of the lungs. Neither is the case more favourable to those in whom the small vessels are ruptured, and pour out their liquids into the cavity of the abdomen. Those certainly die who have polypi in the vessels, or tumors compressing the veins and vessels of the abdomen. A dropsy arising from obstructions in the mensenteric glands is likewise difficult to cure, whether such obstructions arise from a bad habit of body, or from any other cause; if we can, however, by any means remove the disease of the glands, the dropsy easily ceases. But in those who fall into dropsy without any disease preceding, it is not quite so dangerous; and even though a disease has preceded, if the patient's strength be not greatly weakened, if the respiration be free, and the person be not affected with any particular pain, we may entertain great hopes of a cure. But where a great loss of blood is followed by a fever, and that by a dropsy, the patients almost always die, and that

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that in a short time: those, however, are very frequently cured who fall into this disease without any preceding hæmorrhagy.

Cure. In the cure of this disease authors chiefly mention two indications. 1. To expel the superfluous quantity of water; and, 2. To prevent its being again collected. But before we proceed to speak of the remedies, it is necessary to take notice, that by the animal-economy, if a great evacuation of a fluid takes place in any part of the body, all the other fluids in the body are directed towards that part, and those which lie as it were lurking in different parts will be immediately absorbed, and thrown out by the same passage. Hence the humours which in hydropic persons are extravasated into the different cavities of the body will be thrown into the intestines, and evacuated by purgatives; or by diuretics will be thrown upon the kidneys, and evacuated by urine. It is, however, not only necessary to excite these evacuations in order to remove this malady, but they must be assiduously promoted and kept up till the abundant humour is totally expelled. For this reason Sydenham has advised purgatives to be administered every day, unless, either through the too great weakness of the body, or the violent operation of the purgative, it shall be necessary to interpose a day or two now and then; because if any considerable intervals be allowed to take place between the exhibition of the purgatives, an opportunity is given to the waters of collecting again. In this method, however, there is the following inconvenience, that, when the waters are totally evacuated, the strength is at the same time so much exhausted, that the distemper commonly returns in a very short time. Hence almost our only hopes of curing a dropsy consist in gently evacuating the waters by means of diuretics. But the efficacy of these is generally very doubtful. Dr Friend hath long ago observed, that this part of medicine is of all others the most lame and imperfect; but a French physician, Mr Bacher, lately discovered, as he alleges, a method of making the diuretics much more successful. His reputation became at last so great, that the French king thought proper to purchase his secret for a great sum of money. The basis of his medicine was hellebore-root, the malignant qualities of which he pretended to correct in the following manner. A quantity of the dried roots of black hellebore were pounded, and then put into a glazed earthen vessel, and afterwards sprinkled with spirit of wine. They were suffered to stand for twelve hours, stirring them about twice or thrice during that space of time. They were then sprinkled again, and at last good Rhenish wine was poured on till it stood six fingers above the roots. The mixture was frequently agitated with a wooden spatula; and as the wine was imbibed by the roots, more was poured on, so as to keep it always at the same height for 48 hours. The whole was then put on the fire and boiled for half an hour, after which the decoction was violently pressed out; the same quantity of wine was added as at first, and the mixture boiled as before. After the second expression the woody residuum was thrown away as useless. Both the strained liquors are then mixed together with two parts of boiling water to one of the decoction. The whole is afterwards evaporated in a silver vessel to the consistence of a syrup. One part of the extract is again added with two parts of boiling water, and the whole inspissated as before.—By this means, says he, the volatile nauseous acrid particles are separated by evaporation, and the fixed ones remain corrected and prepared for medicinal uses; adding, towards the end, a ninth part of old brandy, and evaporating to the consistence of turpentine. Mr Bacher reasons a good deal on the way in which this process corrects the medicine; but tells us, that notwithstanding the improvement, his pills will not have the desired effect unless properly made up. For forming them, they ought to be mixed with matters both of an inviscating and indurating nature; yet so prepared that it will be readily soluble in the stomach, even of a person already debilitated. For answering these purposes, he chose myrrh and carduus benedictus, and then gives the following receipt for the formation of his pills

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"Take of the extract of hellebore prepared as above directed, and of solution of myrrh, each one ounce; of powdered carduus benedictus three drachms and a scruple. Mix them together, and form into a mass, dividing it into pills of a grain and an half each." To these pills Mr Bacher gives the name of the *pilulæ tonicæ*, from an idea, that while they evacuate the water, they at the same time act as tonics; and thus from augmenting the action of the lymphatics, prevent the return of the disease. And if both these intentions could be effectually answered by the use of the same remedy, it would unquestionably be of great importance in practice.

The effects of these pills were, we are told, very surprising. Dr Daignan relates, that he gave them to 18 hydropic patients at once; and these he divided into three classes, according to the degree of the disease with which they were affected. The first class contained those who laboured under an anasarca following intermittent fevers. The second class contained those who had an anasarca, together with some degree of ascites, arising from tedious febrile disorders. All these were cured; but these two classes consisted of such cases as are most easily removed. But the third contained six who were seized with a most violent anasarca and ascites, after being much weakened by tedious disorders, and of consequence in whom the disease was very difficult to be cured. Even of these, however, four were cured, and the other two died. The body of one of these being dissected, both sides of the cavity of the thorax were found to be full of a blackish red water. The lungs were unsound; there was a polypous concretion in the right ventricle of the heart; the liver and spleen were hard, and of a preternatural bulk; and the glands of the mesentery were obstructed and infarcted. In the other, the liver and pancreas were scirrhous, and the spleen very hard.

The same medicines were given by De Horne to eight persons, six of whom had both an anasarca and ascites, but the other two only an ascites. Four of these recovered; three died without being freed from the dropsy; one in whom the dropsy was cured died in a short time after, having for some time before his death become speechless.

By these patients 10 of the pills were taken at once;

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and the ſame doſe repeated to the third time, with an interval of an hour betwixt each doſe. At firſt they proved purgative, and then diuretic; by which laſt evacuation they finally cured the diſeaſe. But though Mr Bacher was firmly of opinion that his pills cured the dropſy by reaſon of the above-related correction; yet it is certain that, in the hands of other practitioners, theſe very pills have failed, unleſs they alſo made uſe of the ſame regimen recommended by that phyſician; while, on the other hand, it is alſo certain, that different medicines will prove equally efficacious in dropſical caſes, provided this regimen is made uſe of.

For a great number of ages it has been recommended to dropſical patients to abſtain as much as poſſible from drink, and thus to the torments of their diſeaſe was added that of an intolerable thirſt; and how great this torment was, we may underſtand from an example of a friend of king Antigonus, who, having been cloſely watched both by order of the phyſicians and alſo of the king, was ſo unable to bear the raging thirſt occaſioned by his diſeaſe, that he ſwallowed his own excrements and urine, and thus ſpeedily put an end to his life. Dr Milman ſhows at great length the pernicious tendency of this practice. He maintains that it is quite contrary to the ſentiments of Hippocrates and the beſt ancient phyſicians. He aſſerts, that unleſs plenty of diluting drink be given, the beſt diuretics can have no effect. He condemns alſo in the ſtrongeſt terms the practice of giving dropſical patients only dry, hard, and indigeſtible aliments. Theſe would oppreſs the ſtomach even of the moſt healthy; and how much more muſt they do ſo to thoſe who are already debilitated by labouring under a tedious diſorder? By what means alſo are theſe aliments to be diſſolved in the ſtomach when drink is with-held? In this diſeaſe the ſaliva is viſcid, and in ſmall quantity; from whence it may be reaſonably conjectured, that the reſt of the fluids are of the ſame nature, and the gaſtric juices likewiſe depraved. Thus the aliments lie long in the ſtomach; and if the viſcera were formerly free of obſtructions, they are now generated; the ſtrength fails; perſpiration and other excretions are obſtructed; the viſcid and pituitous humours produced by theſe kinds of food float about the præcordia, and increaſe the diſeaſe, while the ſurface of the body becomes quite dry. Nay, ſo much does this kind of diet conſpire with the diſeaſe, that 100 pounds of fluid will ſometimes be imbibed in a few days by hydropic perſons who take no drink. Even in health, if the body from any cauſe becomes dry, or deprived of a conſiderable part of its juices, as by hunger, labour, &c. it will imbibe a conſiderable quantity of moiſture from the air; ſo that we muſt impute the abovementioned extraordinary inhalation, in part at leaſt, to the denial of drink, and to the nature of the aliment given to the ſick. The following is the account given by Dr Milman of his practice in the Middleſex hoſpital.

If the patient be not very much debilitated, he is ſometimes treated with the purging waters, and a doſe of jalap and calomel alternately. On the intermediate days he gets a ſaline mixture, with 40 or 60 drops of *acetum ſcilliticum* every ſixth hour; drinking with the purgatives oat-gruel and ſome thin broths. That he might the better aſcertain what ſhare the liquids given along with the medicines had in producing a copious flow of urine, he ſometimes gave the medicines in the beginning of the diſtemper without allowing the drink: but though the ſwellings were uſually diminiſhed a little by the purgatives, the urine ſtill continued ſcanty, and the patients were greatly weakened. Fearing, therefore, leſt, by following this courſe, the ſtrength of the ſick might be too much reduced, he then began his courſe of diuretic medicines, giving large quantities of barley-water with a little *ſal diureticus*; by which means, ſometimes in the ſhort ſpace of 48 hours after the courſe was begun, the urine flowed out in very large quantity: but as ſaline drinks are very diſagreeable to the taſte, a drink was compoſed purpoſely for hydropic perſons, of half an ounce of cream of tartar diſſolved in two pounds of barley-water, made agreeably ſweet with ſyrup, adding one or two ounces of French brandy.

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To this compoſition Dr Milman was induced by the great praiſes given to cream of tartar by ſome phyſicians in hydropic caſes. In the *Acta Bononienſia*, 15 caſes of hydropic patients are narrated who were cured only by taking half an ounce of cream of tartar daily. But it is remarkable, that by theſe very patients the cream of tartar was taken for 20, 30, nay 40 days, often without any perceptible effect; yet when diſſolved in a large quantity of water, it ſhowed its ſalutary effects frequently within as many hours, by producing a plentiful flow of urine. This liquor is now the common drink of hydropic patients in the hoſpital abovementioned, of which they drink at pleaſure along with their medicines.

Among purgative medicines Dr Milman recommends the *radix ſenekæ*; but ſays the decoction of it, according to the Edinburgh Pharmacopœia, is too ſtrong, as he always found it excite vomiting when prepared as there directed, and thus greatly to diſtreſs the patients: but when only half an ounce or ſix drachms of the root are uſed to a pound of decoction, inſtead of a whole ounce as directed by the Edinburgh college, he finds it an excellent remedy; and though it may ſometimes induce a little vomiting, and frequently a nauſea, yet it ſeldom failed to procure nine or ten ſtools a-day, and ſometimes alſo proved diuretic. But we muſt take care not to be too free in the uſe of ſeneka, or any other purgative, if the patients be very weak; and therefore, after having uſed purgatives for ſome time, it will be proper to depend upon diuretics entirely for perfecting the cure; and of the ſucceſs of this method our author gives ſome very remarkable inſtances. But he obſerves, that after the dropſy is removed, the patients will ſometimes die without any evident cauſe; and of this it is proper that the phyſicians ſhould be aware. It is remarkable with what eaſe a flux of urine is induced in thoſe who have a ſcirrhous liver; while on the other hand, in one who had the meſenteric glands obſtructed, along with a ſcirrhoſity of the liver and vitiated ſtate of the lungs, the moſt powerful diuretics proved ineffectual. In ſome caſes Dr Milman thinks the kidneys may be ſo preſſed with the weight of the water, as to be unable to perform their office. With regard, however, to diuretics in general, it may be remarked, that the operation of none of them can be certainly depended upon. In particular conſtitutions, and at particular times, one will

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Dropsy. be observed to succeed, after another, though commonly much more powerful, has been tried in vain. Accordingly various articles of this kind are often used in succession. Recourse is particularly often had to the roots of taraxacum, of colchicum, and of squills; the latter, especially when combined with calomel, is often found to be a very powerful diuretic. And indeed mercury in different forms, probably from acting as a deobstruent, is often of very great use in dropsical complaints. Among other diuretics, the lactuca virosa has of late been highly extolled by Dr Collins of Vienna, and the nicotiana tabaccum by Dr Fowler of York: but neither has been extensively introduced into practice, although we have known some instances in which the latter has been used with great advantage.

The water having been drawn off, we are to put the patient on a course of strengtheners; such as the Peruvian bark, with some of the warm aromatics, and a due proportion of rhubarb infused in wine and chalybeates. Gentle exercise, and frictions on the belly, with such a course of diet as shall be light and nourishing, are also to be enjoined: and it may be observed, that the use of tonic medicines is by no means to be delayed till a complete evacuation of the water can be obtained. On the contrary, by alternating, and even combining the use of evacuants and tonics, the influence of both is often very much promoted.

When the patient can by no other means be relieved, the operation of paracentesis must be had recourse to, which is described under the article SURGERY.

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GENUS LXXX. HYDROMETRA.
DROPSY of the *Uterus*.

Hydrometra, *Sauv.* gen. 289. *Sag.* 116. *Boerh.* 1224.

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GENUS LXXXI. HYDROCELE.
DROPSY of the *Scrotum*.

Oscheocele, *Sauv.* gen. 41. *Vog.* 388.
Oscheophyma, *Sag.* 44.
Hydrops scroti, *Vog.* 389.
Hydrops testium, *Boerh.* 1227.

For the treatment of these two diseases, we may refer the reader to what has already been said of other species of dropsy, particularly ascites. But both are chiefly to be combated by chirurgical operation, especially the latter, in which it seldom fails to produce a complete cure.

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GENUS LXXXII. PHYSCONIA.
SWELLING of the *Belly*.

Physconia, *Sauv.* gen. 283. *Vog.* 325. *Sag.* gen. 110.
Hyposarca, *Lin.* 218.

This disease may arise from a variety of causes, as from a swelling of the liver, spleen, kidneys, uterus, omentum, ovarium, mesentery, intestines, &c. and sometimes it arises merely from fat. In the former cases, as the viscera are generally scirrhous and indurated, the distemper is for the most part incurable; neither is the prospect much better where the disease is occasioned by a great quantity of fat.

GENUS LXXXIII. RACHITIS.
The RICKETS.

Rachitis.

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Rachitis, *Sauv.* gen. 294. *Lin.* 212. *Vog.* 312. *Sag.* gen. 120. *Boerh.* 1480. *Hoffm.* III. 487. *Zeviani* della Rachitide. *Glisson* de Rachitide.

Description. This is one of the diseases peculiar to infancy. It seldom attacks children till they are nine months, nor after they are two years old; but it frequently happens in the intermediate space between these two periods. The disease shows itself by a flaccid tumor of the head and face, a loose flabby skin, a swelling of the abdomen, and falling away of the other parts, especially of the muscles. There are protuberances of the epiphyses of the joints; the jugular veins swell, while the rest decrease; and the legs grow crooked. If the child has begun to walk before he be seized with this disease, there is a slowness, debility, and tottering in his motion, which soon brings on a constant desire of sitting, and afterwards of lying down; insomuch that nothing at last is moveable but the neck and head. As they grow older, the head is greatly enlarged, with ample sutures; the thorax is compressed on the sides, and the sternum rises up sharp, while the extremities of the ribs are knotty. The abdomen is protuberant, and the teeth black and carious. In such patients as have died of this disease, all the solids appear soft and flaccid, and the fluids dissolved and mucous.

Causes. The rickets may proceed from scrofulous or venereal taints in the parents, and may be increased by those of the nurse. It is likewise promoted by feeding the child with aqueous and mucous substances, crude summer-fruits, fish, unleavened farinaceous aliment, and too great a quantity of sweet things.—Sometimes it follows intermittent fevers and chronic disorders; and in short, is caused by any thing which tends to debilitate the body, and induce a viscid and unhealthy state of the juices.

Prognosis. The rickets do not usually prove fatal by themselves, but if not cured in time, they make the person throughout life deformed in various ways; and often produce very pernicious disorders, such as carious bones in different parts of the body.

Cure. This is to be effected by mild cathartics, alteratives, and tonics, such as are used in other diseases attended with a debility of the system and a vitiated state of the blood and juices. In the Western Islands of Scotland, the medicine used for the cure of the rickets is an oil extracted from the liver of the skate-fish. The method of application is as follows: First, the wrists and ankles are rubbed with the oil in the evening: this immediately raises a fever of several hours duration. When the fever from the first rubbing subsides, the same parts are rubbed again the night following; and repeatedly as long as the rubbing of these parts continues to excite the fever.—When no fever can be excited by rubbing the wrists and ankles alone, they are rubbed again along with the knees and elbows. This increased unction brings on the fever again; and is practised as before, till it no longer has that effect. Then the vertebræ and sides are rubbed, along with the former parts; and this

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this unction, which again brings on the fever, is repeated as the former When no fever can be any longer excited by this unction, a flannel-ſhirt dipped in the oil is put upon the body of the patient: this brings on a more violent and ſenſible fever than any of the former unctions; and is continued till the cure be completed, which it commonly is in a ſhort time.

A German phyſician, Dr Strack, has lately publiſhed a paper, in which he recommends the filings of iron as a certain remedy in the rickets. This diſeaſe, he obſerves, in general begins with children when they are about 16 months old. It is ſeldom obſerved with children before they be one year old, and ſeldom attacks them after they paſs two; and it is very generally worſe where it begins early than where it begins late.

For effecting a cure, it is, he affirms, a matter of the utmoſt conſequence to be able to diſtinguiſh, very early, whether a child will be afflicted with rickets or not. And this, he aſſures us, may be determined by the following ſymptoms: Paleneſs and ſwelling of the countenance; and in that part of the cheeks which ſhould naturally be red, a yellow colour approaching to that of ſulphur. When that is the caſe, he directs that a medicine ſhould be immediately had recourſe to which will retard the further progreſs of the diſeaſe and remove what has already taken place. For this purpoſe, he adviſes that five grains of the filings of iron, and as much rhubarb, ſhould be rubbed up with ten grains of ſugar, and given for a doſe every morning faſting, and every evening an hour before ſupper. But if conſiderable looſeneſs ſhould be produced, it will be neceſſary, at firſt, to perſiſt in the uſe of one doſe only every day.

After a month's continuance in this courſe, according to Dr Strack, there in general enſues a keen appetite for food, quick digeſtion, and a copious flow of urine; by means of which the fulneſs of the face and yellowneſs of the complexion are by degrees removed, while the natural colour of the countenance and firmneſs of the body in general are gradually reſtored. This practice, he aſſures us, has never failed of ſucceſs in any one inſtance; not even in thoſe children born of parents greatly afflicted with the rickets.

In addition to the uſe of chalybeates, great benefit is often alſo obtained in this diſeaſe from the uſe of the cold bath; which, under prudent adminiſtration, is perhaps one of the moſt effectual remedies for this complaint with which we are yet acquainted.

When the bones of rickety children begin to bend, they may ſometimes be reſtored to their natural ſhape by compreſſes, bolſters, and proper ſupports. See the article SURGERY.

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ORDER III. IMPETIGINES.

Impetigines, *Sauv.* Cl. X. Ord. V. *Sag.* Cl. III. Ord. V.

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GENUS LXXXIV. SCROFULA.
KING'S-EVIL.

Scrofula, *Sauv.* gen. 285. *Vog.* 367. *Sag.* 121. Struma, *Lin.* 284.

Scrofula.

Deſcription. This diſeaſe ſhows itſelf by hard, ſcirrhous, and often indolent tumors, which ariſe by degrees in the glands of the neck, under the chin, armpits, and different parts of the body, but moſt commonly in the neck, and behind the ears. In proceſs of time, the cellular ſubſtance, ligaments of the joints, and even the bones themſelves, are affected. In ſcrofula the ſwellings are much more moveable than thoſe of the ſcirrhous kind; they are generally ſofter, and ſeldom attended with much pain; they are tedious in coming to ſuppuration; are very apt to diſappear ſuddenly, and again to riſe in ſome other part of the body. We may likewiſe mention as characteriſtic circumſtances of this diſeaſe, a remarkable ſoftneſs of the ſkin, a kind of fulneſs of the face, generally with large eyes, and a very delicate complexion.

Cauſes. A variety of cauſes have been mentioned as tending to produce ſcrofula; viz. a crude indigeſtible food; bad water; living in damp, low ſituations; its being an hereditary diſeaſe, and in ſome countries endemic, &c. But whatever may in different circumſtances be the exciting or prediſpoſing cauſes of the ſcrofula, the diſeaſe itſelf either depends upon, or is at leaſt much connected with, a debility of the conſtitution in general, and probably of the lymphatic ſyſtem in particular, the complaint always ſhowing itſelf by ſome affections of the latter. And that debility has at leaſt a conſiderable influence in its production is probable, not only from the manifeſt nature of ſome of the cauſes ſaid to be productive of ſcrofula, but likewiſe from ſuch remedies as are found moſt ſerviceable in the cure, which are all of a tonic invigorating nature.

Prognoſis. The ſcrofula is a diſtemper which often eludes the moſt powerful medicines, and therefore phyſicians cannot with any certainty promiſe a cure. It is ſeldom, however, that it proves mortal in a ſhort time, unleſs it attacks the internal parts, ſuch as the lungs, where it frequently produces tubercles that bring on a fatal conſumption. When it attacks the joints, it frequently produces ulcers, which continue for a long time, and gradually waſte the patient; while in the mean time the bones become foul and corroded, and death enſues after a long ſcene of miſery. The prognoſis in this reſpect muſt be regulated entirely by the nature of the ſymptoms.

Cure It was long ſuppoſed that ſcrofula depended upon an acid acrimony of the fluids; and this, it is probable, gave riſe to the uſe of burnt ſponge, different kinds of ſoap, and other alkaline ſubſtances, as the beſt remedies for acidity. But although a ſourneſs of the ſtomach and *primæ viæ* does no doubt frequently occur in theſe complaints, yet this ſymptom ſeems to be entirely the conſequence of that general relaxation which in ſcrofula ſo univerſally prevails, and which does not render it in the leaſt neceſſary to ſuppoſe a general aceſcency of the fluids to take place; as the one very frequently, it is well kn wn, even in other complaints, occurs without the leaſt ſuſpicion of any acid acrimony exiſting in the other. This is alſo rendered very probable from the indolent nature of ſcrofulous tumors, which have been known to ſubſiſt for years without giving any uneaſineſs; which could not have been the caſe, if an acid, or any other acrimony, had prevailed in them.

In the treatment of ſcrofula, different morbid conditions,

ditions, exifting in different parts, require, according to circumftances, various means of cure: but, upon the whole, the remedies directed may be confidered as ufed with a view either to the tumors, to the ulcerations, or to the general ftate of the fyftem.

Gentle mercurials are fometimes of ufe as refolvents in fcrofulous fwellings; but nothing has fuch confiderable influence as a frequent and copious ufe of Peruvian bark. Cold bathing too, efpecially in the fea, together with frequent moderate exercife, is often of fingular fervice here; as is likewife change of air, efpecially to a warm climate.

In the fcrofulous inflammation of the eyes, or ophthalmia ftrumofa, the Peruvian bark has alfo been given with extraordinary advantage: and we meet with an inftance of its having cured the gutta rofacea in the face; a complaint which it is often difficult to remove, and which is extremely difagreeable to the fair fex.

From the various cafes related of tumefied glands, it appears, that when the habit is relaxed and the circulation weak, either from conftitution or accident, the bark is a moft efficacious medicine, and that it acts as a refolvent and difcutient. It will not, however, fucceed in all cafes; but there are few in which a trial can be attended with much detriment. Dr Fothergill obferves, that he has never known it avail much where the bones were affected, nor where the fcrofulous tumor was fo fituated as to be accompanied with much pain, as in the joints, or under the membranous coverings of the mufcles; for when the difeafe attacks thofe parts, the periofteum feldom efcapes without fome injury, by which the bone will of courfe be likewife affected. Here the Peruvian bark is of no effect: inftead of leffening, it rather increafes the fever that accompanies thofe circumftances: and, if it do not really aggravate the complaint, it feems at leaft to accelerate the progrefs of the difeafe.

Various are the modes in which the bark is adminiftered: Dr Fothergill makes ufe of a decoction, with the addition of fome aromatic ingredients and a fmall quantity of liquorice-root, as a form in which a fufficient quantity may be given without exciting difguft. But where it is eafily retained in the ftomach in fubftance, perhaps the beft form of exhibiting it is that of powder; and in this ftate it is often advantageoufly conjoined with powder of cicuta, an article poffeffing very great deobftruent powers.

The powder, however, foon becomes difagreeable to very young patients; and the extract feems not fo much to be depended upon as may have been imagined. In making the extract, it is expofed to fo much heat, as muft have fome effect upon its virtues, perhaps to their detriment In adminiftering it, likewife, if great care be not taken to mix it intimately with a proper vehicle, or fome very foluble fubftance, in weak bowels it very often purges, and thereby not only difappoints the phyfician, but injures the patient. A fmall quantity of the *cortex Winteranus* added gives the medicine a grateful warmth; and a little liquorice, a few raifins, gum arabic, or the like, added to the decoction before it be taken from the fire, by making the liquor vifcid enables it to fufpend more of the fine particles of the bark; by which procefs the medicine is not only improved in efficacy, but at the fame time rendered lefs difagreeable.

Scrofula.

In indolent fwellings of the glands from vifcid humours, fea-water alfo has been ftrongly recommended by Dr Ruffel.

Dr Fothergill alfo acquaints us, that the cicuta even by itfelf is not without a confiderable fhare of efficacy in removing fcrofulous diforders He mentions the cafe of a gentlemwoman, about 28 years of age, afflicted from her infancy with fcrofulous complaints, fevere ophthalmies, glandular fwellings, &c. cured by the *extractum cicutæ* taken conftantly for the fpace of a year. He obferves, however, that when given to children even in very fmall dofes, it is apt to produce fpafmodic affections; for which reafon he rarely exhibits it to them when very young, or even to adults of very irritable habits.

Dr Fothergill gives feveral other inftances of the fuccefs of cicuta in fcrofulous cafes, and even in one which feemed to be not far removed from a confirmed phthifis; but owns that it feldom had fuch good effects afterwards: yet he is of opinion, that where there are fymptoms of tubercles forming, a ftrumous habit, and a tendency to phthifis, the cicuta will often be ferviceable. It is anodyne, corrects acrimony, and promotes the formation of good matter. With regard to the quality of the medicine, he obferves, that the extract prepared from hemlock before the plant arrives at maturity, is much inferior to that which is made when the hemlock has acquired its full vigour, and is rather on the verge of decline: juft when the flowers fade, the rudiments of the feeds become obfervable, and the habit of the plant inclines to yellow. This, he thinks, is the proper time to collect the hemlock. It has then had the full benefit of the fummer heat; and the plants that grow in expofed places will generally be found more active than thofe that grow in the fhade. The lefs heat it undergoes during the preparation, the better. Therefore, if a confiderable quantity of the dry powder of the plant gathered at a proper feafon be added, lefs boiling will be neceffary, and the medicine will be the more efficacious. But let the extract be prepared in what manner foever it may, provided it be made from the genuine plant, at a proper feafon, and be not deftroyed by boiling, the chief difference obfervable in ufing it is, that a larger quantity of one kind is required to produce a certain effect than of another. Twenty grains of one fort of extract have been found equal in point of efficacy to thirty, nay near forty, of another; yet both of them made from the genuine plant, and moft probably prepared with equal fidelity. To prevent the inconveniences arifing from this uncertainty, it feems always expedient to begin with fmall dofes, and proceed ftep by ftep till the extract produces certain effects, which feldom fail to arife from a full dofe. Thefe effects are different in different conftitutions. But, for the moft part, a giddinefs affecting the head, and motions of the eyes as if fomething pufhed them outwards, are firft felt; a flight ficknefs, and trembling agitation of the body; a laxative ftool or two. One or all thefe fymptoms are the marks of a full dofe, let the quantity in weight be what it will. Here we muft ftop till none of thefe effects be felt; and in three or four days advance a few grains more. For it has been fuppofed by moft of thofe who have ufed this medicine to any good purpofe, that the cicuta feldom procures

any

Impetigines. any benefit, though given for a long time, unless in as large a dose as the patient can bear without suffering any of the inconveniences above mentioned. There is, however, reason to believe, that its effects as a discutient are in no degree dependent on its narcotic powers: and we are inclined to think, that recourse is often had to larger doses than are necessary; or at least that the same benefit might be derived from smaller ones continued for an equal length of time.

Patients commonly bear a greater quantity of the extract at night than at noon, and at noon than in the morning. Two drachms may be divided into thirty pills. Adults begin with two in the morning, two at noon, and three or four at night, with directions to increase each dose, by the addition of a pill to each, as they can bear it.

But after all, the best form under which the cicuta can, we think, be exhibited, is that of powder from the leaves. This, either in a state of powder or made into pills, may be given at first to the extent of four or five grains, and the dose gradually rising till it amount to 15 or 20 grains twice or thrice a day. Given to this extent, particularly when conjoined with the Peruvian bark, it has often been found of great service in scrofulous cases. At the same time it must be allowed, that such patients, after resisting every mode of cure, will have in some instances a spontaneous recovery in the progress of life, probably from the system acquiring additional vigour.

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Genus LXXV. SYPHILIS.
Lues Venerea, or *French Pox*.

Syphilis, *Sauv.* gen. 3086. *Lin.* 6. *Vog.* 319. *Sag.* 126.

Lues venerea, *Boerh.* 1440. *Hoffm.* III. 413. *Junck.* 96. *Astruc* de lue Venerea.

Dr Astruc, who writes a very accurate history of the lues venerea, is fully convinced that it is a new disease, which never appeared in Europe till some time between the years 1494 and 1496, having been imported from America by the companions of Christopher Columbus; though this opinion is not without its opponents. Dr Sanches in particular has contended with much learning and ability, that it appeared in Europe at an earlier period: But it is at least certain, that it was altogether unknown to the medical practitioners of Greece and Rome, and that it was a very common disease in America when the Europeans first visited that country. But at whatever period it may have been introduced into Europe, or from whatever source it may have been obtained, there can be no doubt that, as well as small-pox or measles, syphilis depends on a peculiar specific contagion; on a matter *sui generis* which is alone capable of inducing this disease.

The venereal infection, however, cannot, like the contagious miasmata of the small-pox and some other diseases, be carried through the air, and thus spread from place to place: for unless it is transmitted from the parents to the children, there is no other way of contracting the disease but from actual contact with the infectious matter. Thus, when a nurse happens to labour under the disease, the infant that she suckles will receive the infection; as, on the other hand, when the child is infected, the nurse is liable to receive it: and there have even been instances known of lying-in women being infected very violently, from having employed a person to draw their breasts who happened to have venereal ulcers in the throat. It may be caught by touching venereal sores if the cuticle be abraded or torn; and in this way accoucheurs and midwives have sometimes been infected severely. Dr Macbride says, the most inveterate pox he ever saw was caught by a midwife, who happened to have a whitlow on one of her fingers when she delivered a woman ill of the lues venerea.

Syphilis.

But by far the most ready way of contracting this disease is by coition, the genital parts being much more bibulous than the rest of the body. When the disorder is communicated, the places where the morbific matter enters are generally those where it first makes its appearance; and as coition is the most usual way of contracting it, so the first symptoms commonly appear on or near the pudenda.

The patient's own account will, for the most part, help us to distinguish the disease: but there are sometimes cases wherein we cannot avail ourselves of this information, and where, instead of confessing, the parties shall conceal all circumstances; while, on the other hand, there are now and then people to be met with, who persuade themselves that symptoms are venereal, which in reality are owing to some other cause: and therefore it is of the utmost importance to inform ourselves thoroughly of the nature of those symptoms and appearances which may be considered as pathognomic signs of lues venerea.

In the first place, when we find that the local symptoms, such as chancres, buboes, phymosis, and the like, do not give way to the usual methods; or when these complaints, after having been cured, break out again without a fresh infection; we may justly suspect that the virus has entered the whole mass of fluids: but if at the same time ulcers break out in the throat, and the face is deformed by callous tubercles, covered with a brown or yellow scab, we may be assured that the case is now become a confirmed lues, which will require a mercurial course.

When eruptions of the furfuraceous and superficial kind are venereal, they are not attended with itching; and the scale being picked off, the skin appears of a reddish brown, or rather copper-colour, underneath; whereas leprous eruptions are itchy, throw off a greater quantity of scales, and rise in greater blotches, especially about the joints of the knees and elbows. Venereal tubercles or pustules are easily distinguished from carbuncles of the face, by not occupying the cheeks or the nose, nor as having a purulent apex, but are covered at top, either with a dry branny scurf like the superficial eruptions just now mentioned, or else with a hard dry scab of a tawney yellow hue; they particularly break out among the hair or near to it, on the forehead or on the temples.

Venereal ulcers affecting the mouth are distinguishable from those which are scorbutic in the following manner: 1. Venereal ulcers first affect the tonsils, fauces, and uvula; then the gums but these very rarely: on the contrary, scorbutic ulcers affect the gums first of all; then the fauces, tonsils, and uvula. 2. Venereal ulcers frequently spread to the nose; scorbutic ones almost never. 3. Venereal ulcers are callous in the

Impetigines the edges; scorbutic ones are not so 4. Venereal ulcers are circumscribed, and, for the most part, are circular, at least they are confined to certain places; scorbutic ones are of a more irregular form, spread wider, and frequently affect the whole mouth 5 Venereal ulcers are for the most part hollow, and generally covered at bottom with a white or yellow slough; but scorbutic ones are more apt to grow up into loose fungi. 6. Venereal ulcers are red in their circumference, but scorbutic ones are always livid. 7. Venereal ulcers frequently rot the subjacent bones, the scorbutic ones seldom or never. 8 And lastly, Venereal ulcers are most combined with other symptoms which are known to be venereal; scorbutic ones with the distinguishing signs of the scurvy, such as difficult breathing, listlessness, swelling of the legs, rotten gums, &c.

Another sure sign of the confirmed lues is often afforded from certain deep-seated nocturnal pains, particularly of the shins, arms, and head. As for any superficial wandering pains that have no fixed seat, and which affect the membranes of the muscles and ligaments of the joints, they, for they most part, will be found to belong to the gout or rheumatism, and can never be considered as venereal unless accompanied with some other evident signs; but with regard to the pains that are deeply seated, and always fixed to the same place, and which affect the middle and more solid part of the ulna, tibia, and bones of the cranium, and rage chiefly and with greatest violence in the forepart of the night, so that the patient can get no rest till morning approaches, these may serve to convince us that the disease has spread itself throughout the whole habit, whether they be accompanied with other symptoms of the lues or not. *Gummata* in the fleshy parts, *nodes* in the periosteum, *ganglia* upon the tendons, *tophi* upon the ligaments, *exostoses* upon the bones, and *fici* at the verge of the anus, are all of them signs of the confirmed lues: these are hard indolent swellings; but as they sometimes arise independently of any venereal infection, and perhaps may proceed from a scrofulous taint, unless they be accompanied or have been preceded by some of the more certain and evident symptoms of the lues, we must be cautious about pronouncing them venereal. When these swellings are not owing to the syphilitic virus, they are very seldom painful, or tend to inflame and suppurate; whereas those that are venereal usually do, and if they lie upon a bone generally bring on a caries.

These carious ulcers are most commonly met with upon the ulna, tibia, and bones of the cranium; and when accompanied with nocturnal pains, we can never hesitate about declaring their genuine nature. Frequent abortions, or the exclusion of scabby, ulcerated, half-rotten, and dead fetuses, happening without any manifest cause to disturb the fetus before its time, or to destroy it in the womb, may be reckoned as a sure sign that at least one of the parents is infected

These then are the principal and most evident signs of the confirmed lues. There are others which are more equivocal, and which, unless we can fairly trace them back to some that are more certain, cannot be held as signs of the venereal disease: Such are, 1. Obstinate inflammations of the eyes, frequently returning with great heat, itching, and ulceration of the eye-lids. 2. A singing and hissing noise in the ears, with ulcers or caries in the bones of the meatus auditorius. 3. Obstinate head-achs. 4. Obstinate cutaneous eruptions, of the itchy or leprous appearance, not yielding to the milder methods of treatment. 5. Swellings of the bones; and, 6. Wandering and obstinate pains. None of these symptoms, however, can be known to be venereal, except they happen to coincide with some one or other of the more certain signs.

Syphilis.

It may, perhaps, be considered as a singularity in this disease, that the diagnosis is often more difficult in the advanced than in the early periods of the affection. That is, with those who have been certainly subjected to syphilis, it is often very difficult to say whether certain symptoms, remaining after the ordinary modes of cure have been employed, be syphilitic or not. Very frequently, as appears from the sequel, nocturnal pains, ulcerations, and the like, remaining after a long course of mercury has been employed, are in no degree of a venereal nature, but are in reality to be considered as consequences rather of the remedy than of the disease; and are accordingly best removed by nourishing diet, gentle exercise, and tonics But as long as any symptoms of any kind remain, it is often impossible to convince some patients that they are cured; and it is often impossible for a physician with certainty to affirm that the disease is altogether overcome.

Upon the whole, we are first to distinguish and consider the several symptoms apart; and then, by comparing them with each other, a clear judgment may be formed upon the general review.

Prognosis. Being thoroughly convinced that the case is venereal, we are to consider, first of all, whether it be of a longer or shorter date; for the more recent it is, it will, *cæteris paribus*, be less difficult to remove. But there are other circumstances which will assist us in forming a prognostic as to the event. As,

1. The age of the patient. This disorder is more dangerous to infants and old people than to such as are in the flower and vigour of life, in whom some part of the virus may be expelled by exercise, or may be subdued in some degree by the strength of the constitution.

2. The sex. Though women are for the most part weaker than men, and therefore should seem less able to resist the force of any disease, yet experience shows that this is easier borne by them than by men; perhaps owing to the menstrual and other uterine discharges, by which a good share of the virus may be carried off immediately from the parts where it was first applied; for it is observable, that whenever these discharges are obstructed, or cease by the ordinary course of nature, all the symptoms of this disease grow worse.

3. The habit of body. Persons who have acrid juices will be liable to suffer more from the venereal poison than such as have their blood in a milder state; hence, when people of a scorbutic or scrofulous habit contract venereal disorders, the symptoms are always remarkably violent, and difficult to cure. And for the same reasons, the confirmed lues is much more to be dreaded in a person already inclined to an asthma, phthisis, dropsy, gout, or any other chronic distemper,

Impetigines per, than in one of a found and healthy conftitution. For as the original difeafe is increafed by the acceffion of the venereal poifon, fo the lues is aggravated by being joined to an old diforder. The more numerous the fymptoms, and the more they affect the bones, the more difficult the cure. Of all combinations the union of fyphilis with fcrofula is perhaps the moft difficult to overcome: but if the acrimony fhould feize on the nobler internal parts, fuch as the brain, the lungs, or the liver, then the difeafe becomes incurable, and the patient will either go off fuddenly in an apoplectic fit or fink under a confumption.

Cure. Viewing this difeafe as depending on a peculiar contagious matter introduced into the fyftem, and multiplied there, it is poffible to conceive that a cure may be obtained on one of three principles; either by the evacuation of the matter from the fyftem, by the deftruction of its activity, or by counteracting its influence in the fyftem. It is not impoffible that articles exift in nature capable of removing this complaint on each of thefe grounds: but we may venture at leaft to affert, that few fuch are yet difcovered. Notwithftanding numbers of pretended infallible remedies for fyphilis, mercury is perhaps the only article on which dependence is placed among European practitioners; and with regard to its mode of operation, all the three different opinions pointed out have been adopted and fupported by different theorifts.—But although many ingenious arguments have been employed in fupport of each, we are, upon the whole, inclined to think it more probable that mercury operates by deftroying the activity of the venereal virus, than that it has effect either by evacuating it, or by exciting a ftate of action, by which its influence is counteracted. Some practitioners have affirmed, that the difeafe may be totally extirpated without the ufe of mercury: but, excepting in flight cafes, it appears from the moft accurate obfervations, that this grand fpecific is indifpenfable; whether it be introduced through the pores of the fkin, in the form of ointments, plafters, wafhes, &c.; or given by the mouth, difguifed in the different fhapes of pills, troches, powders, or folutions.

Formerly it was held as a rule, that a falivation ought to be raifed, and a great difcharge excited. But this is now found to be unneceffary: for as mercury probably acts by fome fpecific power in fubduing and correcting the venereal virus, all that is required is to throw in a fufficient quantity of the medicine for this purpofe; and if it can be diverted from the falivary glands fo much the better, fince the inconveniences attending a fpitting are fuch as we fhould always wifh to avoid.

Mercury, when combined with any faline fubftance, has its activity prodigioufly increafed; hence the great variety of chemical preparations which have been contrived to unite it with different acids.

Corrofive fublimate is one of the moft active of all the mercurial preparations, infomuch as to become a poifon even in very fmall dofes. It therefore cannot fafely be given in fubftance; but muft be diffolved in order to render it capable of a more minute divifion. We may fee, by looking into Wifeman, that this is an old medicine, though feldom given by regular practitioners. How it came to be introduced into fo remote a part of the world as Siberia, is not eafily found out; but Dr Clerc, author of the *Hiftoire Naturelle de l'Homme Malade*, affures us, that the fublimate folution has been of ufe there time out of mind. Syphilis.

It appears to have been totally forgotten in other places, until of late years, when the Baron Van Swieten brought it into vogue; fo that at one period, if we credit Dr Locher, they ufed no other mercurial preparation at Vienna. The number of patients cured by this remedy alone in the hofpital of St Mark, which is under the care of this gentleman, from 1754 to 1761 inclufive, being 4880.

The way to prepare the folution is, to diffolve as much fublimate in any kind of ardent fpirit (at Vienna they ufe only corn-brandy) as will give half a grain to an ounce of folution. The dofe to a grown perfon is one fpoonful mixed with a pint of any light ptifan or barley-water, and this to be taken morning and evening: the patients fhould keep moftly in a warm chamber, and lie in bed to fweat after taking the medicine: their diet fhould be light; and they ought to drink plentifully throughout the day, of whey, ptifan, or barley-water. If the folution does not keep the belly open, a mild purge muft be given from time to time; for Locher obferves, that thofe whom it purges two or three times a-day, get well fooner than thofe whom it does not purge: he alfo fays, that it very feldom affects the mouth, but that it promotes the urinary and cutaneous difcharges. This courfe is not only to be continued till all the fymptoms difappear, but for fome weeks longer. The fhorteft time in which Locher ufed to let the patients out was fix weeks; and they were continued on a courfe of decoction of the woods for fome weeks after they left off the folution.

This method has been introduced both in Britain and Ireland, though by no means to the exclufion of others; but it appears, that the folution does not turn out fo infallible a remedy, either in thefe kingdoms, or in France, as they fay it has done in Germany. It was feldom if ever found to perform a radical cure, and the frequent ufe of it proved in many cafes highly prejudicial. It has therefore been fucceeded in practice, even at Vienna, by mercury exhibited in other forms; and, among thefe, by a remedy firft recommended by Dr Plenck, and fince improved by Dr Saunders; confifting of mercury united with mucilage of gum arabic, which is faid to render its exhibition perfectly mild and fafe. For particulars, we refer to Dr Saunders's treatife.

But a late French writer, fuppofed to be Dr Petit, in a fmall book, intitled *A parallel of the different methods of treating the venereal difeafe*, infifts, that there is neither certainty nor fafety in any other method than the repeated frictions with mercurial ointment.

If therefore it is determined to have recourfe to the mercurial frictions, the patient may with advantage be prepared by going into the warm bath fome days fucceffively; having been previoufly blooded if of a plethoric habit, and taking a dofe or two of fome proper cathartic.

The patient being fitted with the neceffary apparatus of flannels, is then to enter on the courfe.

If

Impetigines

If the person be of a robust habit, and in the prime of life, we may begin with two drachms of the *unguentum hydrargyri fortius*, (Ph. Lond.) which is to be rubbed in about the ankles by an assistant whose hands are covered with bladders: then having intermitted a day, we may expend two drachms more of the ointment, and rest for two days; after which, if no soreness of the mouth comes on, use only one drachm; and at every subsequent friction ascend till the ointment shall reach the trunk of the body; after which the rubbings are to be begun at the wrists, and from thence gradually extended to the shoulders. In order to prevent the mercury from laying too much hold of the mouth, it must be diverted to the skin, by keeping the patient in a constant perspiration from the warmth of the room, and by drinking plentifully of barley-water, whey, or ptisan; but if, nevertheless, the mercury should tend to raise a spitting, then, from time to time, we are either to give some gentle cathartic, or order the patient into a vapour or warm bath: and thus we are to go on, rubbing in a drachm of the ointment every second, third, or fourth night, according as it may be found to operate; and on the intermediate days either purging or bathing, unless we should choose to let the salivation come on; which, however, it is much better to avoid, as we shall thus be able to throw in a larger quantity of mercury.

It is impossible to ascertain the quantity of mercury that may be necessary to be rubbed in, as this will vary according to circumstances: but we are always to continue the frictions for a fortnight at least, after all symptoms of the disease shall have totally disappeared; and when we have done with the mercury, warm bathing, and sudorific decoctions of the woods, are to be continued for some time longer.

This is a general sketch of the methods of treatment for the confirmed lues; but for a complete history of the disease, and for ample directions in every situation, we refer to Astruc, and his abridger Dr Chapman.—We have to add, however, that a method of curing this disease by fumigation has been lately recommended in France; but it seems not to meet with great encouragement. One of the most recent proposals for the cure of the venereal disease is that of Mr Clare, and consists in rubbing a small quantity of mercury under the form of *mercurius muriatus mitis*, or *calomel* as it is commonly called, on the inside of the cheek; by which means it has been supposed that we will not only avoid the inconveniences of unction, but also the purgative effects that are often produced by this medicine when taken into the stomach. But after all, the introduction of mercury under the form of unction, as recommended by the latest and best writers in Britain on the venereal disease, Dr Swediaur, Mr John Hunter, and others, is still very generally preferred in Britain to any mode that has yet been proposed.

Where, after a long trial of mercury, distressing symptoms still remain, particularly obstinate ulcerations and severe pains, benefit has often been derived from the use of opium: but there is little reason to believe, as has been held by some, that of itself it affords an infallible cure of this disease; at least we are inclined to think, that all the facts hitherto brought in support of the cure of syphilis by opium are at the utmost very doubtful. Syphilis.

In obstinate ulcerations, remaining probably after the venereal virus has been overcome, and resisting the use of mercury, a complete cure has in many instances been obtained from the use of the root of the mezereon, the daphne mezereum of Linnæus. This article has been chiefly employed under the form of decoction; and it now appears that it is the basis of an article at one time highly celebrated in venereal complaints, under the title of *Lisbon diet-drink*. But, upon the whole, these sequelæ of this disease are perhaps more readily overcome by country air, gentle exercise, and nourishing diet, particularly a milk diet, than by the use of any medicine whatever. It must indeed be allowed, that for combating different sequelæ, various practices accommodated to the nature of these will on particular occasions be requisite. But into the consideration of these we cannot here propose to enter.

Genus LXXXVI. SCORBUTUS. 352
Scurvy.

Scorbutus, *Sauv.* gen. 391. *Lin.* 223. *Vog.* 318. *Sag.* 127. *Boerh.* 1148. *Hoffm.* III. 369. *Junck.* 91. *Lind* on the Scurvy. *Hulme* de Scorbuto. *Rouppe* de morbis Navigantium.

Description. The first indication of the scorbutic diathesis is generally a change of colour in the face, from the natural and healthy look to a pale and bloated complexion, with a listlessness, and aversion from every sort of exercise; the gums soon after become itchy, swell, and are apt to bleed on the slightest touch; the breath grows offensive; and the gums, swelling daily more and more, turn livid, and at length become extremely fungous and putrid, as being continually in contact with the external air; which in every case favours the putrefaction of substances disposed to run into that state, and is indeed absolutely requisite for the production of actual rottenness.

The symptoms of the scurvy, like those of every other disease, are somewhat different in different subjects, according to the various circumstances of constitution; and they do not always proceed in the same regular course in every patient. But what is very remarkable in this disease, notwithstanding the various and immense load of distress under which the patients labour, there is no sickness at the stomach, the appetite keeps up, and the senses remain entire almost to the very last: when lying at rest, they make no complaints, and feel little distress or pain; but the moment they attempt to rise or stir themselves, then the breathing becomes difficult, with a kind of straitness or catching, and great oppression, and sometimes they have been known to fall into a syncope. This catching of the breath upon motion, with the loss of strength, dejection of spirit, and rotten gums, are held as the essential or distinguishing symptoms of the disease. The skin is generally dry, except in the very last stage, when the patients become exceedingly subject to faintings, and then it grows clammy and moist: in some it has an anserine appearance; but much oftener it is smooth and shining; and, when examined, is found to be spread over with spots not rising above the surface, of a redish, bluish, livid, or purple colour, with

Impetigines a sort of yellow rim round them. At first these spots are for the most part small, but in time they increase to large blotches. The legs and thighs are the places where they are principally seen: more rarely on the head and face. Many have a swelling of the legs, which is harder, and retains the impression of the finger longer than the common dropsical or truly œdematous swellings. The slightest wounds and bruises, in scorbutic habits, degenerate into foul and untoward ulcers. And the appearance of these ulcers is so singular and uniform, that they are easily distinguished from all others. Scorbutic ulcers afford no good digestion, but give out a thin and fetid ichor mixed with blood, which at length has the appearance of coagulated gore lying caked on the surface of the sore, not to be separated or wiped off without some difficulty. The flesh underneath these sloughs feels to the probe soft and spongy, and is very putrid. Neither detergents nor escharotics are here of any service; for though such sloughs be with great pains taken away, they are found again at the next dressing, where the same sanguineous putrid appearance always presents itself. Their edges are generally of a livid colour, and puffed up with excrescences of proud flesh arising from below the skin. As the violence of the disease increases, the ulcers shoot out a soft bloody fungus, which often rises in a night's time to a monstrous size; and although destroyed by cauteries, actual or potential, or cut away with the knife, is found at next dressing as large as ever. It is a considerable time, however, before these ulcers, bad as they are, come to affect the benes with rottenness—These appearances will always serve to assure us that an ulcer is scorbutic; and should put us on our guard with respect to the giving mercurials, which are the most pernicious things that can be administered in these cases.

Scorbutic people, as the disease advances, are seldom free from pains; though they have not the same seat in all, and often in the same person shift their place. Some complain of universal pain in all their bones; but most violent in the limbs, and especially the joints: the most frequent seat of their pain, however, is some part of the breast. The pains of this disease seem to arise from the distraction of the sensible fibres by the extravasated blood being forced into the interstices of the periosteum and of the tendinous and ligamentous parts; whose texture being so firm, the fibres are liable to higher degrees of tension, and consequently of pain.

The states of the bowels are various: in some there is an obstinate costiveness; in others a tendency to a flux, with extremely fetid stools: the urine is also rank and fetid, generally high-coloured; and, when it has stood for some hours, throws up an oily scum on the surface. The pulse is variable: but most commonly slower and more feeble than in the time of perfect health. A stiffness in the tendons, and weakness in the joints of the knees, appear early in the disease: but as it grows more inveterate, the patients generally lose the use of their limbs altogether; having a contraction of the flexor-tendons in the ham, with a swelling and pain in the joint of the knee. Some have their legs monstrously swelled, and covered over with livid spots or ecchymoses; others have had tumors there; some, though without swelling, have the calves of the legs and the flesh of the thighs quite indurated. As persons far gone in the scurvy are apt to faint, and even expire, on being moved and brought out into the fresh air, the utmost care and circumspection are requisite when it is necessary to stir or remove them. Scorbutus.

Scorbutic patients are at all times, but more especially as the disease advances, extremely subject to profuse bleedings from different parts of the body; as from the nose, gums, intestines, lungs, &c. and likewise from their ulcers, which generally bleed plentifully if the fungus be cut away. It is not easy to conceive a more dismal and diversified scene of misery than what is beheld in the third and last stage of this distemper; it being then that the anomalous and more extraordinary symptoms appear, such as the bursting out of old wounds, and the dissolution of old fractures that have been long united.

Causes. The term *scurvy* has been indiscriminately applied, even by physicians, to almost all the different kinds of cutaneous foulness; owing to some writers of the last century, who comprehended such a variety of symptoms under this denomination, that there are few chronic distempers which may not be so called, according to their scheme: but the disease here meant is the true putrid scurvy, so often fatal to seamen, and to people pent up in garrisons without sufficient supplies of sound animal-food and fresh vegetables; or which is sometimes known to be endemic in certain countries, where the nature of the soil, the general state of the atmosphere, and the common course of diet, all combine in producing that singular species of corruption in the mass of blood which constitutes this disease; for the appearances, on dissecting scorbutic subjects, sufficiently show that the scurvy may, with great propriety, be termed a disease of the blood.

Dr Lind has, in a postscript to the third edition of his treatise on the scurvy, given the result of his observations drawn from the dissection of a considerable number of victims to this fatal malady, from which it appears that that true scorbutic state, in an advanced stage of the distemper, consists in numerous effusions of blood into the cellular interstices of most parts of the body, superficial as well as internal; particularly the gums and the legs; the texture of the former being almost entirely cellular, and the generally dependent state of the latter rendering these parts, of all others in the whole body, the most apt to receive, and retain the stagnant blood, when its crasis comes to be destroyed; and it loses that glutinous quality which, during health, hinders it from escaping thro' the pores in the coats of the blood-vessels or through exhalant extremities.

A dropsical indisposition, especially in the legs and breast, was frequently, but not always, observed in the subjects that were opened, and the pericardium was sometimes found distended with water: the water thus collected was often so sharp as to shrivel the hands of the dissector; and in some instances, where the skin happened to be broken, it irritated and festered the wound.

The fleshy fibres were found so extremely lax and tender, and the bellies of the muscles in the legs and thighs so stuffed with the effused stagnating blood, that it was always difficult, and sometimes impossible, to

Petigines to raise or separate one muscle from another. He says that the quantity of this effused blood was amazing; in some bodies it seemed that almost a fourth part of the whole mass had escaped from the vessels; and it often lay in large concretions on the periosteum, and in some few instances under this membrane immediately on the bone. And yet, notwithstanding this dissolved and depraved state of the external fleshy parts, the brain always appeared perfectly sound, and the viscera of the abdomen, as well as those in the thorax, were in general found quite uncorrupted. There were spots indeed, from extravasated blood, observed on the mesentery, intestines, stomach, and omentum; but these spots were firm, and free from any mortified taint; and, more than once, an effusion of blood, as large as a hand's breadth, has been seen on the surface of the stomach; and what was remarkable, that very subject was not known while living to have made any complaint of sickness, pain, or other disorder, in either stomach or bowels.

These circumstances and appearances, with many others that are not here enumerated, all prove to a demonstration a putrescent, or at least a highly depraved state of the blood: and yet Dr Lind takes no small pains to combat the idea of the scurvy's proceeding from animal putrefaction; a notion which, according to him, "may, and hath misled physicians to propose and administer remedies for it altogether ineffectual."

He also, in the preface to his third edition, talks of the mischief done by an attachment to delusive theories. He says, "it is not probable that a remedy for the scurvy will ever be discovered from a preconceived hypothesis, or by speculative men in the closet, who have never seen the disease, or who have seen at most only a few cases of it;" and adds, "that though a few partial facts and observations may, for a little, flatter with hopes of greater success, yet more enlarged experience must ever evince the fallacy of all positive assertions in the healing art."

Sir John Pringle, however, is of a very different opinion. He "is persuaded, after long reflection, and the opportunities he has had of conversing with those who to much sagacity had joined no small experience in nautical practice, that upon an examination of the several articles which have either been of old approved, or have of late been introduced into the navy, it will appear, that though these means may vary in form and in mode of operating, yet they all some way contribute towards preventing putrefaction; whether of the air in the closer parts of a ship, of the meats, of the water, of the clothes and bedding, or of the body itself."

What Dr Lind has above advanced is the more remarkable, as, in the two former editions of his book, he embraced the hypothesis of animal-putrefaction being the cause of the scurvy; and if these effusions of blood, from a destruction of its crasis and the dissolved state of the muscular fibres, together with the rotten condition of the mouth and gums, do not betray putrescency, it is hard to say what does, or what other name we shall bestow on this peculiar species of depravation which constitutes the scurvy.

The blood, no doubt, derives its healthy properties, and maintains them, from the due supplies of wholesome food; while the insoluble, superfluous, effete, and acrid parts, are carried off by the several discharges of stool, urine, and perspiration.

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Our senses of taste and smell are sufficient to inform us when our food is in a state of soundness and sweetness, and consequently wholesome; but it is from chemistry that we must learn the principles on which these qualities chiefly depend.

Experiments of various kinds have proved, that the soundness of animal and vegetable substances depends very much, if not entirely, on the presence of their aerial principle; since rottenness is never observed to take place without an emission of fixed air from the putrefying substance: and even when putrefaction has made a considerable progress, if aerial acid can be transferred, in sufficient quantity, from some other substance in a state of effervescence or fermentation, into the putrid body, the offensive smell of this will be destroyed; and if it be a bit of rotten flesh with which the experiment is made, the firmness of its fibres will be found in some measure restored.

The experiments of Dr Hales, as well as many others made since his time, show that an aerial principle is greatly connected with, and remarkably abundant in, the gelatinous parts of animal bodies, and in the mucilage or farina of vegetables. But these are the parts of our food which are most particularly nutritive; and Dr Cullen, whose opinion on this as on every other medical subject must be allowed of the greatest weight, affirms, in his Lectures on the Materia Medica, that the substances on which we feed are nutritious only in proportion to the quantities of oil and sugar which they respectively contain. This oil and sugar are blended together in the gelatinous part of our animal-food, and in the mucilaginous and farinaceous part of esculent vegetables; and, while thus intimately combined, are not perceivable by our taste, though very capable of being developed and rendered distinct by the power of the digestive organs; for in consequence of the changes produced during digestion, the oily and the saccharine matter become manifest to our senses, as we may see and taste in the milk of animals, which is chiefly chyle a little advanced in its progress toward sanguification; the oil is observed to separate spontaneously, and from which a quantity of actual sugar may be obtained by a very simple process.

Thus much being premised, we can now readily comprehend how the blood may come to lose those qualities of smoothness, mildness, and tenacity which are natural to it. For if, in the first place, the fluids, and organs subservient to digestion should be so far distempered or debilitated that the nutritious parts of the food cannot be properly developed, the blood must be defrauded of its due supplies; which will also be the case if the aliment should not originally contain enough of oily and saccharine matter, or should be so circumstanced, from being dried or salted, as to hinder the ready extrication of the nutritious parts; or lastly, if the natural discharges should be interrupted or suspended so that the superfluous, acrid, and effete fluids are retained in the general mass; in all these instances the blood must of necessity run into proportionate degrees of depravation.

And hence we may understand how it may possibly happen, Impetigines happen, that when perfons are greatly weakened by fome preceding diforder, and at the fame time debarred the ufe of proper bodily exercife, the fcorbutic diathefis fhould take place, even though they enjoy the advantages of pure air and wholefome diet. But thefe are folitary cafes, and very rarely feen; for whenever the fcurvy feizes numbers, and can be confidered as an epidemic difeafe, it will be found to depend on a combination of the major part, or perhaps all, of the following circumftances:

1. A moift atmofphere, and more efpecially if cold be joined to this moifture. 2. Too long ceffation from bodily exercife, whether it be from conftraint, or a lazy flothful difpofition 3. Dejection of mind 4. Neglect of cleanlinefs, and want of fufficient clothing. 5. Want of wholefome drink, either of pure water or fermented liquors And, . Above all, the being obliged to liv continually on falted meats, perhaps not well cured, without a du proportion of the vegetables fufficient to correct the pernicious tendency of the falt, by fupplying the bland oil and faccharine matter requifite for the purpofes of nutrition.

Thefe general principles refpecting the caufes and nature of fcurvy, feem to afford a better explanation of the phenomena of the difeafe than any conjectures refpecting it that have hitherto been propofed. It muft, however, be allowed, that Dr Lind is by no means the only writer who is difpofed to confider this difeafe as not referable to the condition of the circulating fluids. In a late ingenious treatife on this fubject by Dr Milman, he ftrenuoufly contends, that the primary morbid affection in this complaint is a debilitated ftate of the folids arifing principally from want of aliment. But his arguments on this fubject, as well as thofe of Dr Lind, are very ably anfwered by a ftill later writer on this fubject, Dr Trotter, who has drawn his obfervations refpecting it from very extenfive experience, and who confiders it as clearly eftablifhed, by incontrovertible facts, that the proximate caufe of fcurvy depends on fome peculiar ftate of the blood.—Dr Trotter, in the fecond edition of his Obfervations on the Scurvy, from the refult of farther obfervation and later difcoveries in chemiftry, has attempted, with much ingenuity, to prove that the morbid condition of the blood, which takes place in fcurvy, arifes from the abftraction of vital air, or, as it is now generally called, *oxygene*; and this opinion, though ftill, perhaps, in fome particulars requiring farther confirmation, is, it muft be allowed, fupported by many plaufible arguments.

Prevention and Cure. The fcurvy may be prevented, by obviating and correcting thofe circumftances in refpect of the non-naturals which were mentioned as contributing to the difeafe, and laid down as caufes. It is therefore a duty highly incumbent on officers commanding at fea, or in garrifons, to ufe every poffible precaution; and, in the firft place, to correct the coldnefs and moifture of the atmofphere by fufficient fires: in the next, to fee that their men be lodged in dry, clean, and well ventilated births or apartments: thirdly, to promote cheerfulnefs, and enjoin frequent exercife, which alone is of infinite ufe in preventing the fcurvy: fourthly, to take care that the cloathing be proper, and cleanlinefs of perfon ftrictly obferved: fifthly, to fupply them with wholefome drink, either pure water or found fermented liquors; and if fpirits be allowed, to have them properly diluted with water and fweetened with melaffes or coarfe fugar: and laftly, to order the falted meats to be fparingly ufed, or fometimes entirely abftained from; and in their place, let the people live on different compofitions of the dried vegetables; frefh meat and recent vegetables being introduced as often as they can poffibly be procured.

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A clofe attention to thefe matters will, in general, prevent the fcurvy from making its appearance at all, and will always hinder it from fpreading its influence far. But when thefe precautions have been neglected, or the circumftances fuch that they cannot be put in practice, and the difeafe hath actually taken place, our whole endeavour muft be to reftore the blood to its original ftate of foundnefs: and happily, fuch is the nature of this difeafe, that if a fufficiency of new matter, of the truly mild nutritious fort, and particularly fuch as abounds with vital air, fuch as recent vegetables, or different acid fruits, can be thrown into the circulation while the flefhy fibres retain any tolerable degree of firmnefs the patient will recover; and that in a furprifingly fhort fpace of time, provided a pure air, comfortable lodgings, fufficient cloathing, cleanlinefs, and exercife, lend their neceffary aid.

This being the cafe, the plan of treatment is to be conducted almoft entirely in the dietetic way; as the change in the mafs of blood, which it is neceffary to produce, muft be brought about by things that can be received into the ftomach by pints or pounds, and not by thofe which are adminiftered in drops or grains, drachms or ounces. For here, as there is no diforder of the nervous fyftem, we have no need of thofe active drugs which are indifpenfably neceffary in febrile or nervous difeafes; the fcorbutic diathefis being quite oppofite to that which tends to produce a fever or any fpecies of fpafmodic diforders; nay, Dr Lind fays, he has repeatedly found, that even the infection of an hofpital fever is long refifted by a fcorbutic habit.

It will now naturally occur to the reader, what thofe alimentary fubftances muft be which bid the faireft to reftore the blood to its healthy ftate; and he needs fcarcely to be told, that they are of thofe kinds which the ftomach can bear with pleafure though taken in large quantities, which abound in jelly or mucilage, and which allow thofe nutritious parts to be eafily developed; for though the vifcera in fcorbutic patients may be all perfectly found, yet we cannot expect that either the digeftive fluids or organs fhould poffefs the fame degrees of power, which enable them, during health, to convert the crude dry farinacea, and the hard falted flefh of animals, into nourifhment. We muft therefore fearch for the *antifcorbutic virtue* in the tender fweet flefh of herbivorous animals; in new milk; and in the mucilaginous acid juices of recent vegetables, whether they be fruits, leaves, or roots.

The four juices of lemons, oranges, and limes, have been generally held as antifcorbutics in an eminent degree, and their power afcribed to their acid; from an idea that acids of all kinds are the only correctors of putrefaction. But the general current of practical obfervations

Antiscorbutics. observations shows, and our experiments confirm it, that the virtue of these juices depends on their *aerial principle*; accordingly, while perfectly recent and in the mucilaginous state, and especially if mixed with wine and sugar, the juices of any one of these fruits will be found a most grateful and powerful antiscorbutic.

Dr Lind observing, "that the lemon-juice, when given by itself undiluted, was apt, especially if overdosed, to have too violent an operation, by occasioning pain and sickness at the stomach, and sometimes a vomiting; therefore found it necessary to add wine and sugar. A pint of Madeira wine, and two ounces of sugar, were put to four ounces and a half of juice, and this quantity was found sufficient for weak patients to use in 24 hours: such as were very weak sipped a little of this frequently according as their strength would permit; others who were stronger took about two ounces of it every two hours; and when the patients grew still stronger, they were allowed eight ounces of lemon-juice in 24 hours."

While this very pleasant mixture, which is both a cordial and an antiseptic, may be had, it would be needless to think of prescribing any other; but when the fresh juice cannot be procured, we must have recourse to such other things as may be obtained. But the various modes of combining and administering these, so as to render them perfectly agreeable to the stomach, must always be regulated by circumstances, and therefore it will be in vain to lay down particular directions; since all that we have to do is, to fix on such fruits and other fresh vegetables as can be most conveniently had and taken, and contrive to give them in those forms, either alone or boiled up with flesh-meat into soups, that will allow the patients to consume the greatest quantities.

The first promising alteration from such a course is usually a gentle diarrhœa; and if, in a few days, the skin becomes soft and moist, it is an infallible sign of recovery; especially if the patient gain strength, and can bear being stirred or carried into the open air without fainting.

But if the belly should not be loosened by the use of the fresh vegetables, nor the skin become soft and moist, then they must be assisted by stewed prunes, or a decoction of tamarinds with cream of tartar, in order to abate the costiveness; and by drinking a light decoction of the woods, and warm bathing, in order to relax the pores of the skin; for nothing contributes more to the recovery of scorbutic patients than moderate sweating.

With regard to particular symptoms, antiseptic mouth-waters composed of a decoction of the Peruvian bark and infusion of roses, with a solution of myrrh, must be used occasionally, in order to cleanse the mouth, and give firmness to the spongy gums. Swelled and indurated limbs, and stiffened joints, must be bathed with warm vinegar, and relaxed by the steam of warm water, repeatedly conveyed to them, and confined to the parts by means of close blankets: ulcers on the legs must never be treated with unctuous applications nor sharp escharotics; but the dressing should consist of lint or soft rags, dipt in a strong decoction of Peruvian bark.

This disease at no time requires, or indeed bears, large evacuations, either by bleeding or purging; and, as has been already mentioned, the belly must only be kept open by the fresh vegetables or the mildest laxatives. But we are always to be careful that scorbutic persons, after a long abstinence from greens and fruits, be not permitted to eat voraciously at first, lest they fall into a fatal dysentery. See Lutus.

All, however, that has now been laid down as necessary towards the cure, supposes the patients to be in situations where they can be plentifully furnished with all the requisites; but unhappily these things are not to be procured at sea, and often deficient in garrisons: therefore, in order that a remedy for the scurvy might never be wanting, Dr Macbride, in the year 1762, first conceived the notion, that the *infusion of malt*, commonly called *wort*, might be substituted for the common antiscorbutics; and it was accordingly tried.

More than three years elapsed before any account arrived of the experiments having been made: at length, ten histories of cases were received, wherein the wort had been tried, with very remarkable success; and this being judged a matter of great importance to the seafaring part of mankind, these were immediately communicated to the public in a pamphlet under the title of *An historical account of a new method of treating the scurvy at sea.*

This was in 1767; but after that time a considerable number of letters and medical journals, sufficient to make up a small volume, were transmitted to the author, particularly by the surgeons of his Majesty's ships who had been employed of late years for making discoveries in the southern hemisphere. Certain it is, that in many instances it has succeeded beyond expectation. In others it has fallen short: but whether this was owing to the untoward situation of the patients, or inattention on the part of the persons who were charged with the administration of the wort, not preparing it properly, or not giving it in sufficient quantity, or to its own want of power, must be collected from the cases and journals themselves.

During Captain Cook's third voyage, the most remarkable, in respect of the healthiness of the crew, that ever was performed, the wort is acknowledged to have been of singular use.

In a letter which this very celebrated and successful circumnavigator wrote to Sir John Pringle, he gives an account of the methods pursued for preserving the health of his people; and which were productive of such happy effects, that he performed "a voyage of three years and 18 days, through all the climates from 52° north to 71° south, with the loss of one man only by disease, and who died of a complicated and lingering illness, without any mixture of scurvy. Two others were unfortunately drowned, and one killed by a fall; so that out of the whole number 118 with which he set out from England, he lost only four.

He says, that much was owing to the extraordinary attention of the admiralty, in causing such articles to be put on board as either by experience or conjecture were judged to tend most to preserve the health of seamen; and with respect to the wort, he expresses himself as follows:

"We had on board a large quantity of *malt*, of which

Impetigines which was made *sweet wort*, and given (not only to those men who had manifest symptoms of the scurvy, but to such also as were, from circumstances, judged to be most liable to that disorder) from one or two to three pints in the day to each man, or in such proportion as the surgeon thought necessary, which sometimes amounted to three quarts in the 24 hours: this is without doubt one of the best antiscorbutic sea-medicines yet found out; and if given in time, will, with proper attention to other things, I am persuaded, prevent the scurvy from making any great progress for a considerable time: but I am not altogether of opinion that it will cure it, in an advanced state, at sea."

On this last point, however, the Captain and his Surgeon differ; for this gentleman positively asserts, and his journal (in Dr Macbride's possession) confirms it, that the infusion of malt did effect a cure in a confirmed case, and at sea.

The malt, being thoroughly dried, and packed up in small casks, is carried to sea, where it will keep sound, in every variety of climate, for at least two years: when wanted for use, it is to be ground in a hand-mill, and the infusion prepared from day to day, by pouring three measures of boiling water on one of the ground malt; the mixture being well mashed, is left to infuse for 10 or 12 hours, and the clear infusion then strained off. The patients are to drink it in such quantities as may be deemed necessary, from one to three quarts in the course of the 24 hours: a panado is also to be made of it, by adding biscuit, and currants or raisins; and this palatable mess is used by way of solid food. This course of diet, like that of the recent vegetables, generally keeps the bowels sufficiently open; but in cases where costiveness nevertheless prevails, gentle laxatives must be interposed from time to time, together with diaphoretics, and the topical assistants, fomentations and gargles, as in the common way of management

Captain Cook was also provided with a large stock of *sour krout*; (cabbage-leaves cut small, fermented and stopped in the second stage of fermentation.) A pound of this was served to each man, twice a-week, while they were at sea. Sour krout, since the trial made of it on board Captain Cook's ships, has been extensively used by direction of the British government in many other situations, where scorbutus has prevailed; and it has been found to be highly serviceable both in preventing and in curing the disease. It was particularly found during the late American war to be highly beneficial to the British troops besieged in Boston, who were at that time entirely fed on salt provisions sent from England. The scurvy at one period broke out among them with very alarming appearances; but by the seasonable arrival of a quantity of sour krout, it was effectually overcome. Care, however, must be bestowed, that this article be properly prepared and properly kept. When due attention is paid to these particulars, it may be preserved in good condition for many months; and is considered both by sailors and soldiers as a very acceptable addition to their salt provisions. But when served out to them in a putrid state, it is not only highly disagreeable to the taste, but probably also pernicious in its effects

Among other means of preventing scurvy, Captain Cook had also a liberal supply of *portable soup*; Scorbutus. of which the men had generally an ounce, three days in the week, boiled up with their pease; and sometimes it was served to them oftener; and when they could get fresh greens, it was boiled up with them, and made such an agreeable mess, that it was the means of making the people eat a greater quantity of greens than they would otherwise have done. And what was still of further advantage, they were furnished with sugar in lieu of butter or oil, which is seldom of the sweetest sort; so that the crew were undoubtedly great gainers by the exchange.

In addition to all these advantages of being so well provided with every necessary, either in the way of diet or medicine, Captain Cook was remarkably attentive to all the circumstances respecting cleanliness, exercise, sufficient cloathing, provision of pure water, and purification of the air in the closer parts of the ship.

From the effect of these different means, as employed by Captain Cook, there can be little doubt that they will with due attention be sufficient for the prevention and cure of the disease, at least in most situations: but besides these, there are also some other articles which may be employed with great advantage.

Newly brewed spruce-beer made from a decoction of the tops of the spruce-fir and melasses, is an excellent antiscorbutic: it acts in the same way that the wort does, and will be found of equal efficacy, and therefore may be substituted. Where the tops of the spruce-fir are not to be had, this beer may be prepared from the essence of spruce as it has been called, an article which keeps easily for a great length of time. But in situations where neither the one nor the other can be had, a most salutary mess may be prepared from oatmeal, by infusing it in water, in a wooden vessel, till it ferments, and begins to turn sourish; which generally happens, in moderately warm weather, in the space of two days.—The liquor is then strained off from the grounds, and boiled down to the consistence of a jelly, which is to be eat with wine and sugar, or with butter and sugar.

Nothing is more commonly talked of than a *land-scurvy*, as a distinct species of disease from that which has been now described; but no writer has yet given a description so clear as to enable us to distinguish it from the various kinds of cutaneous foulness and eruption, which indeed are vulgarly termed *scorbutic*, but which are a-kin to the itch or leprosy, and for the most part require mercurials. These, however, are very different diseases from the true scorbutus, which, it is well known, may prevail in certain situations on land as well as at sea, and is in no degree to be attributed to sea air.

GENUS LXXXVII. ELEPHANTIASIS. 352

Elephantiasis, *Sauv.* gen. 30?. *Vog.* 321. *Sag.* gen. 128.

Elephantia Arabum, *Vog.* 322.

The best account of this disease is that by Dr Heberden, published in the first volume of the Medical Transactions. According to him, frequently the first symptom is a sudden eruption of tubercles, or bumps of different sizes, of a red colour, more or less intense (attended

Impetigines (attended with great heat and itching), on the body, legs, arms, and face; ſometimes in the face and neck alone, at other times occupying the limbs only; the patient is feveriſh; the fever ceaſing, the tubercles remain indolent, and in ſome degree ſcirrhous, of a livid or copper colour, but ſometimes of the natural colour of the ſkin, or at leaſt very little altered; and ſometimes they after ſome months ulcerate, diſcharging a fetid ichorous humour in ſmall quantity, but never laudable pus.

The features of the face ſwell and enlarge greatly; the part above the eye-brows ſeems inflated; the hair of the eye-brows falls off, as does the hair of the beard; but Dr Heberden has never ſeen any one whoſe hair has not remained on his head. The *alæ naſi* are ſwelled and ſcabrous; the noſtrils patulous, and ſometimes affected with ulcers, which, corroding the cartilage and *ſeptum naſi*, occaſion the noſe to fall. The lips are tumid; the voice is hoarſe; which ſymptom has been obſerved when no ulcers have appeared in the throat, although ſometimes both the throat and gums are ulcerated. The ears, particularly the lobes, are thickened, and occupied by tubercles. The nails grow ſcabrous and rugoſe, appearing ſomething like the rough bark of a tree; and the diſtemper advancing, corrodes the parts gradually with a dry ſordid ſcab or gangrenous ulcer; ſo that the fingers and toes rot and ſeparate joint after joint. In ſome patients the legs ſeem rather poſts than legs, being no longer of the natural ſhape, but ſwelled to an enormous ſize, and indurated, not yielding to the preſſure of the fingers; and the ſuperficies is covered with very thin ſcales, of a dull whitiſh colour, ſeemingly much finer, but not ſo white as thoſe obſerved in the *lepra Græcorum*. The whole limb is overſpread with tubercles, interſperſed with deep fiſſures; ſometimes the limb is covered with a thick moiſt ſcabby cruſt, and not unfrequently the tubercles ulcerate. In others the legs are emaciated, and ſometimes ulcerated; at other times affected with tubercles without ulceration. The muſcular fleſh between the thumb and fore-finger is generally extenuated.

The whole ſkin, particularly that of the face, has a remarkably ſhining appearance, as if it was varniſhed or finely poliſhed. The ſenſation in the parts affected is very obtuſe, or totally aboliſhed; ſo that pinching, or puncturing the part, gives little or no uneaſineſs; and in ſome patients, the motion of the fingers and toes is quite deſtroyed. The breath is very offenſive; the pulſe in general weak and ſlow.

The diſeaſe often attacks the patient in a different manner from that above-deſcribed, beginning almoſt inſenſibly; a few indolent tubercles appearing on various parts of the body or limbs, generally on the legs or arms, ſometimes on the face, neck, or breaſt, and ſometimes in the lobes of the ears, increaſing by very ſlow degrees, without any diſorder, previous or concomitant, in reſpect of pain or uneaſineſs.

To diſtinguiſh the diſtemper from its manner of attacking the patient, Dr Heberden ſtyles the firſt by *fluxion* and the other by *congeſtion*. That by fluxion is often the attendant of a crapula, or ſurfeit from groſs foods; whereby, perhaps, the latent ſeeds of the diſorder yet dormant in the maſs of blood are excited; and probably from frequent obſervations of this kind (the laſt meal always having the blame laid on it), it is, that, according to the received opinion, either fiſh, (the tunny, mackarel, and ſhell-fiſh, in particular), melons, cucumbers, young garden-beans, or mulberries, eaten at the ſame meal with butter, cheeſe, or any preparation with milk, are ſuppoſed to produce the diſtemper, and are accordingly religiouſly avoided.

Elephantiaſis.

Violent commotions of the mind, as anger, fear, and grief, have more than once been obſerved to have given riſe to the diſorder; and more frequently, in the female ſex, a ſudden ſuppreſſion of an accuſtomed evacuation, by bathing the legs and feet in cold water at an improper ſeaſon.

The diſorder by fluxion is what is the ofteneſt endeavoured to be remedied by timely application; that by congeſtion, not being ſo conſpicuous, is generally either neglected or attempted to be concealed, until perhaps it be too late to be cured, at leaſt unleſs the patients would ſubmit to a longer courſe of medicine and ſtricter regimen of diet than they are commonly inclined to do.

Several incipient diſorders by fluxion have been known to yield to an antiphlogiſtic method, as bleeding, refrigerant ſalts, in the ſaline draughts, and a ſolution of cryſtals of tartar in water, for common drink, (by this means endeavouring to precipitate part of the peccant matter, perhaps too groſs to paſs the pores by the kidneys); and when once the fever is overcome, the Peruvian bark combined with ſaſſafras is the remedy principally to be relied on. The only topical medicine preſcribed by Dr Heberden, was an attenuating embrocation of brandy and alkaline ſpirit. By the ſame method ſome confirmed caſes have been palliated. But, excepting in one patient, he never ſaw or heard of a confirmed elephantiaſis radically cured. He adds, however, that he never met with another patient poſſeſſed with prudence and perſeverance enough to proſecute the cure as he ought.

GENUS LXXXVIII. LEPRA. The LEPROSY. 353

Lepra, *Sauv.* gen. 303. *Lin.* 262. *Sag.* 129.
Lepra *Græcorum*, *Vog.* 320.

THIS diſtemper is but little known to phyſicians in the weſtern parts of Europe. Wallis tells us, that it firſt begins with red pimples, or puſtules, breaking out in various parts of the body. Sometimes they appear ſingle; ſometimes a great number ariſe together, eſpecially on the arms and legs: as the diſeaſe increaſes, freſh pimples appear, which, joining the former, make a ſort of cluſters; all which enlarge their borders, and ſpread in an orbicular form. The ſuperficies of theſe puſtules are rough, whitiſh, and ſcaly; when they are ſcratched the ſcales fall off, upon which a thin ichor oozes out, which ſoon dries and hardens into a ſcaly cruſt. Theſe cluſters of puſtules are at firſt ſmall and few; perhaps only three or four in an arm or leg, and of the ſize of a ſilver penny. But if the diſeaſe be ſuffered to increaſe, they become more numerous, and the cluſters increaſe to the ſize of a crown-piece, but not exactly round. Afterwards it increaſes to ſuch a degree, that the whole body is covered with a leprous ſcurf. The cure of this diſtemper is very much the ſame

Impetigines ſame with that of the ELEPHANTIASIS. Here, however, recourſe is frequently had to antimonial and mercurial medicines, continued for a conſiderable length of time. In conjunction with theſe, warm bathing, particularly the vapour bath, has often been employed with advantage.

Although what can ſtrictly be called lepra is now, at leaſt, a very rare diſeaſe in this country, yet to this general head may be referred a variety of cutaneous affections which are here very common, and which in many inſtances prove very obſtinate. Theſe appear under a variety of different forms; ſometimes under that of red puſtules; ſometimes of white ſcurfs; ſometimes of ulcerations; and not unfrequently a tranſition takes place from one form to another, ſo that they cannot be divided into different genera from the external appearance. Theſe affections will often yield to the remedies already mentioned; but where antimonials and mercurials either fail, or from different circumſtances are conſidered as unadviſable, a cure may ſometimes be effected by others. In particular caſes, purging mineral waters, the decoction of elm bark, the infuſion of the œnanthe crocata, and various others, have been employed with ſucceſs. Different external applications alſo have ſometimes been employed with advantage. An article uſed in this way, known under the name of Gowland's lotion, with the compoſition of which we are unacquainted, has been much celebrated, and has been ſaid to be uſed with great ſucceſs, particularly againſt eruptions on the face and noſe.

354 GENUS LXXXIX. FRAMBOESIA.
The YAWS.

Frambœſia, *Sauv.* gen. 125. *Sag.* 125.

Deſcription. The deſcription which is given of this diſtemper by the anonymous author of a paper in the ſixth volume of the Edinburgh Medical Eſſays (art. 76.) differs, in ſome circumſtances, from one that Sauvages received from M. Virgile, an eminent ſurgeon of Montpelier, who practiſed 12 years in the iſland of St Domingo; and therefore he diſtinguiſhes the *frambœſia* into two ſpecies, *Guineenſis* and *Americana*.

The *frambœſia Guineenſis* is ſaid by the firſt mentioned writer to be ſo common on the coaſt of Guinea and other parts of Africa, that it ſeldom fails to attack each individual of both ſexes, one time or other, in the courſe of their lives; but moſt commonly during childhood or youth. "It makes its appearance in little ſpots on the cuticle, level with the ſkin, at firſt no larger than a pin's head, which increaſe daily, and become protuberant like pimples: ſoon after the cuticle frets off, and then, inſtead of finding pus or ichor, in this ſmall tumor, only white ſloughs or ſordes appear, under which is a ſmall red fungus, growing out of the cutis, increaſing gradually to very different magnitudes, ſome leſs than the ſmalleſt wood ſtrawberry, ſome as big as a raſpberry, and others exceeding in ſize even the largeſt mulberries; which berries they very much reſemble, being knobbed as they are." Theſe protuberances, which give the name to the diſeaſe, appear on all parts of the body: but the greateſt numbers, and the largeſt ſized, are generally found in the groins, and about the pudenda or anus, in the arm-pits, and on the face: when the yaws are very large, they are few in number; and when remarkably numerous, they are leſs in ſize. The patients, in all other reſpects, enjoy good health, do not loſe their appetite, and ſeem to have little other uneaſineſs than what the ſores occaſion. Frambœſia.

M. Virgile deſcribes the ſpecies of yaws that is common among the negroes of St Domingo, and which Sauvages has termed *frambœſia Americana*, as beginning from an ulcer that breaks out indiſcriminately in different parts of the body, though moſt commonly on the legs; at firſt ſuperficial, and not different from a common ulcer in any other circumſtances ſave its not healing by the uſual applications; ſooner or later, numerous fungous excreſcences break out on the ſurface of the body, as before deſcribed, like little berries, moiſt, with a reddiſh mucus. Beſides theſe, the ſoles of the feet and palms of the hands became raw, the ſkin fretting off, ſo as to leave the muſcles bare: theſe excoriations are ſometimes moiſt with ichor and ſometimes dry, but always painful, and conſequently very diſtreſſing. They are mentioned alſo by the author of the article in the Medical Eſſays; and both he and M. Virgile obſerve, that there is always one excreſcence, or yaw, of an uncommon ſize, which is longer in falling off than the others, and which is conſidered as the *maſter-yaw*, and ſo termed. An ingenious inaugural diſſertation on the ſubject of the yaws was lately publiſhed at Edinburgh by Dr Jonathan Anderſon Ludford, now phyſician in Jamaica. The author of that diſſertation conſiders Dr Cullen as improperly referring frambœſia to the claſs of cachexiæ. He thinks that this diſeaſe ought rather to be referred to the exanthemata; for, like the ſmall-pox, he tells us it has its acceſſion, height, and decline. It begins with ſome degree of fever, either more or leſs violent; it may be propagated by inoculation; and it attacks the ſame individual only once in the courſe of a lifetime, thoſe who once recover from the diſeaſe being never afterwards affected with it. Theſe particulars reſpecting frambœſia are reſted not merely on the authority of Dr Ludford, but are ſupported alſo by the teſtimony of Dr William Wright, a phyſician of diſtinguiſhed eminence, who, while he reſided in Jamaica, had, in the courſe of extenſive practice, many opportunities of obſerving this diſeaſe, and to whom Dr Ludford acknowledges great obligations for having communicated to him many important facts reſpecting it.

Dr Ludford conſiders the yaws as being in every inſtance the conſequence of contagion, and as depending on a matter *ſui generis*. He conſiders no peculiar prediſpoſition from diet, colour, or other circumſtances, as being in any degree neceſſary. He views the diſeaſe as chiefly ariſing from contact with the matter, in conſequence of ſleeping in the ſame bed, waſhing in the ſame veſſel with the infected, or the like. In ſhort, the yaws may be communicated by any kind of contact; nay, it is even believed that flies often convey the infection, when, after having gorged themſelves with the virulent matter by ſucking the ulcers of thoſe who are diſeaſed, they make punctures in the ſkin of ſuch as are ſound, and thus inoculate them; in conſequence of which the diſorder will ſoon appear, provided the *morbific diſpoſition* of body be preſent.

Prognoſis. The yaws are not dangerous, if the cure be

Frengine. be skilfully managed at a proper time; but if the patient has been prematurely salivated, or has taken any quantity of mercury, and his skin been suddenly cleared thereby, the cure will be very difficult, if not impracticable.

Cure. In attempting the cure of this disease, the four following indications are chiefly to be held in view:

1. To support the strength of the patient.
2. To promote excretion by the skin.
3. To correct the vitiated fluids.
4. To remove and counteract the injuries done either to the constitution in general, or to particular parts, by the disease.

With the first of these intentions, a liberal diet, consisting of a considerable quantity of animal food, with a considerable proportion of wine, and gentle exercise, are to be employed: but the cure is principally to be effected by mercurial salivation, after the virulent matter has been completely thrown out to the surface of the body by sudorifics. The following are the particular directions given on this head by the author of the article in the Medical Essays. The yaws being an infectious disease, as soon as they begin to appear on a negro, he must be removed to a house by himself; or, if it is not certain whether the eruption be the yaws or not, shut him up seven days, and look on him again, as the Jews were commanded to do with their lepers, and in that time you may be commonly certain.

As soon as you are convinced that it is the yaws, give a bolus of flowers of sulphur, with camphor and theriaca. Repeat this bolus every night for a fortnight or three weeks, or till the yaws come to the height; that is, when they neither increase in size or number: then throw your patient into a gentle salivation with calomel given in small doses, without farther preparation; five grains repeated once, twice, or thrice a-day, is sufficient, as the patient can bear it. If he spits a quart in 24 hours, it is enough. Generally, when the salivation is at this height, all the yaws are covered with a dry scaly crust or scab; which, if numerous, look terribly. These fall off daily in small white scales; and in ten or twelve days leave the skin smooth and clean. Then the calomel may be omitted, and the salivation permitted to go off of itself. A dram of corrosive sublimate dissolved in an ounce of rum or brandy, and the solution daubed on the yaws, will, it is said, in general clear the skin in two days time.

After the salivation, sweat the patient twice or thrice in a frame or chair with spirits of wine; and give an alterative electuary of æthiops and gum guaiac. He may likewise use the decoction of guiacum and sassafras fermented with melasses, for his constant drink while the electuary is taking, and a week or a fortnight after the electuary is finished

The master-yaw must be consumed an eighth or a tenth part of an inch below the skin, with *Mercur. corros. rub.* & *alum. ust. an. part. æqual.* and digested with *Ung. basil. flav.* ℥j. and *mercur. corros. rub.* ʒj. and cicatrized with lint pressed out of spirits of wine, and with the vitriol of copper.

After the yaws are cured, some patients are afflicted with carbuncles in their feet; which sometimes render them incapable of walking, unless with pain. The method of cure is, by bathing and paring, to destroy the cuticle, and then proceed as in the master-yaw. The gentle escharotics are to be preferred, especially here; and all imaginable care is to be taken to avoid the tendons and periosteum. Trichoma.

To children under six or seven years old, at the proper time of salivating, when the yaws are come to their full growth, give a grain or two of calomel in white sugar, once a-day, once in two days, or once in three days, so as only to keep their mouths a little sore till the yaws dry, and, falling off in white scales, leave the skin clean. This succeeds always, but requires a longer time than in adults.

In St Domingo they salivated by unction; but it does not appear that success always followed this practice. It is also usual in that island to give the solution of corrosive sublimate along with a decoction of sarsaparilla. Twelve ounces of this root, and 12 pounds of the coarsest sugar, macerated for 15 days in 12 quarts of water, is mentioned as a specific, and said to be the prescription of an English physician; the dose is four ounces every sixth hour.

Genus XC. TRICHOMA. 355
The Plica Polonica, or *Plaited Hair.*

Trichoma, *Sauv.* gen. 311. *Sag.* 137.
Plica, *Lin.* 313.
Plica sive Rhopalosis, *Vog.* 323.

This disorder is only met with in Poland and Lithuania, and consists of several blood-vessels running from the head into the ends of the hairs; which cleave together, and hang from the head in broad flat pieces, generally about an ell in length, but sometimes they are five or six yards long; one patient hath more or less of these, up to 20, and sometimes 30. They are painful to the wearer, and odious to every spectator. At the approach of winter an eruptive fever happens to many in these countries: the eruptions principally infest the head, and when at the height an ichorous humour flows from them. In this state they are too tender to admit of being touched, and the matter running down the hairs mats them together; the skin by degrees breaking, the ramifications of the capillary vessels following the course of the hair, or prolonged out of the skin, are increased to a vast length.

No method of relief is yet known; for if the discharge be checked, or the vessels cut off, the consequence is an increase of more miserable symptoms, and in the end death. Sennertus says, when all the morbid matter is thrown out of the body the plicæ fall off spontaneously. He further observes, that the only safe practice in this case is, to solicit the peccant matter to the hairs, to which it naturally tends; and that this is best answered by lotions of bear's-breech. Some say that a decoction of the herb club-moss, and its seeds, with which the head is to be washed, is a specific.

Genus XCI. ICTERUS. 356
The Jaundice.

Icterus, *Lin.* 224. *Vog.* 306. *Boerh.* 918. *Junck.* 90.
Aurigo, *Sauv.* gen. 306. *Sag.* 132.
Cachexia icterica, *Hoffm.* III. 301.

 Description.

Impetigines. Icterus.

Description. The jaundice first shows itself by a listlessness and want of appetite, the patient becomes dull, oppressed, and generally costive. These symptoms have continued but a very short time, when a yellow colour begins to diffuse itself over the *tunica albuginea*, or white part of the eye, and the nails of the fingers; the urine becomes high coloured, with a yellowish sediment capable of giving a yellow tinct to linen; the stools are whitish or grey. In some there is a most violent pain in the epigastric region, which is considerably increased after meals. Sometimes the patient has a continual propensity to sleep; but in others there is too great watchfulness; and sometimes the pain is so great, that though the patient be sleepy he cannot compose himself to rest. The pains come by fits; and most women who have had the jaundice and born children, agree, that they are more violent than labour-pains. As the disease increases, the yellow colour becomes more and more deep; an itching is felt all over the skin; and even the internal membranes of the viscera, the bones, and the brain itself, become tinged, as hath been shown from dissections, where the bones have been found tinged sometimes for years after the jaundice has been cured.

In like manner, all the secretions are affected with the yellow colour of the bile, which in this disease is diffused throughout the whole mass of fluids. The saliva becomes yellowish and bitter; the urine excessively high-coloured, in such a manner as to appear almost black; nay, the blood itself is sometimes said to appear of a yellow colour when drawn from a vein; yet Dr Heberden says that he never saw the milk altered in its colour, even in cases of very deep jaundice. In process of time the blood begins to acquire a tendency to dissolution and putrefaction; which is known by the patient's colour changing from a deep yellow to a black or dark yellow. Hæmorrhagies ensue from various parts of the body, and the patients frequently die of an apoplexy; though in some the disease degenerates into an incurable dropsy; and there have not been wanting instances of some who have died of the dropsy after the jaundice itself had been totally removed.

Causes. As the jaundice consists in a diffusion of the bile throughout the whole system, it thence follows, that whatever may favour this diffusion is also to be reckoned among the causes of jaundice. Many disputes have arisen concerning the manner in which the bile is resorbed into the blood; but it is now generally agreed that it is taken up by the lymphatics of the gall-bladder and biliary ducts. Hence, a jaundice may arise from any thing obstructing the passage of the bile into the duodenum, or from any thing which alters the state of the lymphatics in such a manner as to make them capable of absorbing the bile in its natural state. Hence the jaundice may arise from scirrhi of the liver or other viscera pressing upon the biliary ducts, and obstructing the passage of the bile; from flatus distending the duodenum, and shutting up the entrance of the ductus communis choledochus into it; from the same orifice being plugged up by viscid bile, or other sordes; but by far the most frequent cause of jaundice is the formation of calculi, or more properly biliary concretions: for although they were long considered as being of a calcareous nature, yet more accurate experiments have now demonstrated, that they consist principally of a sebaceous matter; accordingly, while they are so light as to swim in water, they are also highly inflammable. These are found of almost all sizes, from that of a small pea to that of a walnut, or bigger: they are of different colours; and sometimes appear as if formed in the inward part by crystallization, but of lamellæ on the outer part; though sometimes the outward part is covered with rough and shining crystals, while the inward part is lamellated. These enter into the biliary ducts, and obstruct them, causing a jaundice, with violent pain for some time; and which can be cured by no means till the concretion is either passed entirely through the ductus communis or returned into the gall-bladder. Sometimes, in the opinion of many celebrated physicians, the jaundice is occasioned by spasmodic constrictions of the biliary ducts; but this is denied by others, and it is not yet ascertained whether these ducts are capable of being affected by spasm or not, as the existence of muscular fibres in them has not with certainty been discovered. It cannot, however, be denied, that violent fits of passion have often produced jaundice, sometimes temporary, but frequently permanent. This has been by some deemed a sufficient proof of the spasmodic contraction of the ducts; but their opponents suppose, that the agitation occasioned by the passion might push forward some biliary concretion into a narrow part of the duct, by which means a jaundice would certainly be produced, till the concretion was either driven backward or forward into the duodenum altogether. But even supposing the ducts themselves to be incapable of spasm, yet there can be no doubt that by a spasm of the intestines biliary concretions may be retained in the ducts; and indeed it is principally where the duct entering obliquely into the intestine forms as it were a species of valve that these concretions are retained.

In a very relaxed state of the body there is also an absorption of the bile, as in the yellow fever; and indeed in all putrid disorders there is a kind of yellowish tinct over the skin, though much less than in the true jaundice. The reason of this is, that in these disorders there is usually an increased secretion of bile, commonly of a thinner consistence than in a healthy state, while the orifices of the lymphatics are probably enlarged, and thus ready to absorb a fluid somewhat thicker than what they ought to take up in a healthy state; but these disorders are of short duration in comparison with the real jaundice, which sometimes lasts for many years. These affections, however, cannot with propriety in any case be considered as real instances of jaundice; for to constitute that disease, bile must not only be present in the blood, but wanting in the alimentary canal.

It is observable, that women are more subject to jaundice than men, which probably arises from their more sedentary life; for this, together with some of the depressing passions of the mind, are found to promote the accession of the disease, if not absolutely to produce it. Pregnant women also are frequently attacked by the jaundice, which goes off after their delivery.

Prognosis. As jaundice may arise from many different causes, some of which cannot be discovered during the patient's life, the prognosis must on this account be very uncertain. The only cases which admit of

Icterus. of a cure are thofe depending upon biliary concretions, or obftructions of the biliary ducts by vifcid bile; for the concretions are feldom of fuch a fize that the ducts will not let them pafs through, though frequently not without extreme pain. Indeed this pain, though fo violent, and almoft intolerable to the fick perfon, affords the beft prognofis; as the phyfician may readily affure his patient that there is great hope of his being relieved from it. The coming on of a gentle diarrhœa, attended with bilious ftools, together with the ceffation of pain, are figns of the difeafe being cured. We are not, however, always to conclude, becaufe the difeafe is not attended with acute pain, that it is therefore incurable; for frequently the paffage of a concretion through the biliary ducts is accompanied only with a fenfation of flight uneafinefs.

Cure. The great object to be aimed at in the cure of jaundice is unqueftionably the removal of the caufe which obftructs the paffage of bile into the inteftine: But before this can be accomplifhed, practices are often neceffary for alleviating urgent fymptoms; which may be done fometimes by fupplying the want of bile in the alimentary canal, fometimes by affording an exit for bilious matter from the general mafs of blood, but moft frequently by obviating the effects of diftenfion and obftruction to the circulation in the fyftem of the liver.

The meafures to be employed for the removal of the obftruction muft depend very much on the nature of the obftructing caufe.

When the jaundice arifes from indurated fwellings or fcirrhi of the vifcera, it is abfolutely incurable; neverthelefs, as thefe cannot always be difcovered, the phyfician ought to proceed in every cafe of jaundice as if it arofe from calculi. The indications here are, 1. To diffolve the concretions; and, 2. To prevent their formation a fecond time. But unhappily the medical art has not yet afforded a folvent for biliary concretions. They cannot even be diffolved when tried out of the body either by acids or alkalies, or any thing but a mixture of oil of turpentine and fpirit of wine; and thefe fubftances are by far too irritating to be given in fufficient quantity to affect a concretion in the biliary ducts. Boerhaave obferves, that difeafes of the liver are much more difficult to cure than thofe in any other part of the body; becaufe of the difficulty there is in getting at the part affected, and the tedious and round-about paffage the blood hath to it. The juice of common grafs has indeed been recommended as a fpecific in the jaundice, but on no very good foundation. Gliffon obferves, that black cattle are fubject to biliary concretions when fed with hay or dried ftraw in winter, but are cured by the fucculent grafs in the fpring; and Van Swieten tells a ftrange ftory of a man who cured himfelf of the jaundice by living almoft entirely on grafs, of which he devoured fuch quantities, that the farmers were wont to drive him out of their fields; but other practitioners have by no means found this in any degree effectual. The only method of cure now attempted in the jaundice is to expel the concretion into the inteftines; for which vomits and exercife are the principal medicines. The former are juftly reckoned the moft efficacious medicines, as they powerfully fhake all the abdominal and thoracic vifcera; and thus tend to diflodge any obftructing matter that may be contained in them. But if there be a tendency to inflammation, vomits muft not be exhibited till bleeding has been premifed. We muft alfo proceed with caution if the pain be very fharp; for in all cafes where the difeafe is attended with violent pain, it will be neceffary to allay it by opiates before the exhibition of an emetic. There is alfo danger, that, by a continued ufe of vomits, a concretion which is too large to pafs, may be fo impacted in the ducts, that it cannot even be returned into the gall-bladder, which would otherwife have happened. In all cafes, therefore, if no relief follows the exhibition of the fecond or third emetic, it will be prudent to forbear their farther ufe for fome time.

Of all kinds of exercife, that of riding on horfeback is moft to be depended upon in this difeafe. It operates in the fame manner with vomits, namely, by the concuffion it gives to the vifcera; and therefore the cautions neceffary to be obferved in the ufe of vomits are alfo neceffary to be obferved in the ufe of riding. Cathartics alfo may be of fervice, by cleanfing the *primæ viæ*, and foliciting a difcharge of the bile into the inteftines; but they muft not be of too draftic a nature, elfe they may produce incurable obftructions, by bringing forward concretions that are too large to pafs. Anodynes and the warm bath are ferviceable by their relaxing quality; and there can be no doubt that, from acting as powerful antifpafmodics, they often give an opportunity for the difcharge of concretions by very flight caufes, when they would otherwife be firmly retained. Soap has been fuppofed to do fervice as a folvent; but this is now found to be a miftake, and it acts in no other way than as a relaxant or as a gentle purgative.

But when all means of relief fail, as in cafes of fcirrhous, we can then only attempt to palliate the fymptoms, and preferve the patient's life as long as poffible. This is beft accomplifhed by diuretics; for thus a great quantity of bilious matter is evacuated, and the fyftem is freed from the bad confequences which enfue on its ftagnation in the habit. But even this is by no means equal to the common evacuation by ftool; nor can all the attempts to fupply the want of bile in the inteftines by bitters and other ftomachics reftore the patient to his wonted appetite and vigour. If the pain be very violent, we muft on all occafions have recourfe to opiates; or if the blood has acquired a tendency to diffolution, it muft be counteracted by proper antifeptics.

If the difeafe goes off, its return muft be prevented by a courfe of tonic medicines, particularly the Peruvian bark and antifeptics: but we can by no means be certain that the jaundice will not return, and that at any interval; for there may be a number of concretions in the gall-bladder, and though one hath paffed, another may very quickly follow, and produce a new fit of jaundice; and thus fome people have continued to be affected with the diftemper, at fhort intervals, during life.

In the Eaft-Indies, mercury has been lately recommended as exceedingly efficacious in diforders of the liver, efpecially thofe which follow intermitting and remitting fevers. Dr Monro, in his Obfervations on the means of preferving the health of foldiers, acquaints us, that he has feen fome icteric cafes which, he thought, Impetigines received benefit from taking a few grains of *mercurius dulcis* at night, and a purge next morning; and this repeated two or three times a-week.

Infants are fubject to a temporary jaundice, commonly called the *gum*, foon after birth, the caufe of which is not well underftood. It differs remarkably from the common jaundice; as, in the latter, the difeafe is firft difcoverable in the white of the eyes; but though the fkin of infants in the gum is all over yellow, their eyes always remain clear. The diforder goes off fpontaneoufly, or by the ufe of a gentle purgative or two.

357 CLASS IV. LOCALES.

Vitia, *Sauv*. Clafs I. *Lin*. Cl. XI. *Vog*. Cl. X. *Sag*. Cl. I.

Plagæ, *Sag*. Cl. II.
Morbi organici Auctorum.

358 Order I. DYSÆSTHESIÆ.

Dyfæfthefiæ, *Sauv*. Cl. VI. Ord. I. *Sag*. Cl. IX. Ord. I.

359 Genus XCII. CALIGO.
The Cataract.

Caligo, *Sauv*. gen. 153. *Vog*. 288. *Sag*. gen. 259.
Cataracta, *Lin*. 109.

A *cataract* is an obftruction of the pupil, by the interpofition of fome opaque fubftance which either diminifhes or totally extinguifhes the fight. It is generally an opacity in the cryftalline humour. In a recent or beginning *cataract*, the fame medicines are to be ufed as in the *gutta ferena*; and they will fometimes fucceed. But when this does not happen, and the cataract becomes firm, it muft be couched, or rather extracted; for which operation, fee Surgery.—Dr Buchan fays he has refolved a recent cataract by giving the patient fome purges with calomel, keeping a poultice of frefh hemlock conftantly upon the eye, and a perpetual blifter on the neck.

There is, however, but little reafon to fuppofe that thefe practices will frequently fucceed. A refolution can only be effected here by an abforption of the opaque matter; and where this is poffible, there is perhaps a better chance of its being effected by the agency of the electric fluid than by any other means. For this purpofe electricity is chiefly applied under the form of the *electric aura*, as it has been called; but even this is very rarely fuccefsful.

360 Genus XCIII. AMAUROSIS.
The Gutta Serena.

Amaurofis, *Sauv*. gen. 155. *Lin*. 110. *Vog*. 238. *Sag*. 261.

Amblyopia, *Lin*. 108. *Vog*. 236.

A *gutta ferena* is an abolition of the fight without any apparent caufe or fault in the eyes. In every cafe it depends on an affection of fome part of the optic nerve. But the affections which may produce this difeafe are of different kinds. When it is owing to a decay or wafting of the optic nerve, it does not admit Amaurofis. of a cure; but when it proceeds from a compreffion of the nerves by redundant humours, thefe may be in fome meafure drained off, and the patient relieved. For this purpofe, the body muft be kept open with the laxative mercurial pills. If the patient be young, and of a fanguine habit, he may be bled. Cupping with fcarifications on the back part of the head will likewife be of ufe. A running at the nofe may be promoted by volatile falts, ftimulating powders, &c. But the moft likely means of relieving the patient, are iffues or blifters kept open for a long time on the back part of the head, behind the ears, or on the neck; which have been known to reftore fight even after it had been for a confiderable time loft.—Should thefe fail, recourfe muft be had to a mercurial falivation; or, what will perhaps anfwer the purpofe better, 12 grains of the corrofive fublimate mercury may be diffolved in an Englifh pint and a half of brandy, and a table-fpoonful of it taken twice a-day, drinking half a pint of the decoction of farfaparilla after it.—Of late electricity has been much celebrated as efficacious, when no other thing could do fervice; and here it has in fome degree the fame chance of fuccefs as in other cafes of infenfibility, depending on an affection of the nerves, in fome of which it has certainly in particular cafes been of ufe.

In the amaurofis, Dr Porterfield obferves, that it is of the utmoft confequence to know of how long ftanding the difeafe has been; which is not always eafily done if one eye only be affected. This is a very effential point; becaufe an amaurofis of long ftanding is altogether incurable. Mr Boyle mentions the cafe of a man who had a cataract for feveral years without knowing it himfelf, though others did. He difcovered it at laft by happening to rub his found eye, and was furprifed to find himfelf in the dark. When a perfon therefore has a gutta ferena only in one of the eyes, he may think that the eye has but lately loft the power of fight; though this perhaps has been the cafe for feveral years. On the other hand, he may imagine that a recent difeafe of this kind is really of long ftanding. But by inquiring at what time he firft became fubject to miftakes in all actions that require the diftance to be exactly diftinguifhed, as in pouring liquor into a glafs, fnuffing a candle, threading a needle, we may difcover the age of the difeafe, and thence be affifted to form a more juft prognoftic with refpect to its cure. Dr Porterfield gives an inftance of his conjecturing in this manner concerning the cafe of a young lady who had difcovered a lofs of fight in one of her eyes only the day before. The difeafe was thought to be of long ftanding; but as the Doctor found that fhe had only been fubject to miftakes of the kind above mentioned for about a month, he drew a favourable prognoftic, and the difeafe was cured.

Genus XCIV. DYSOPIA.
Depraved Vision. 361

Amblyopia, *Sauv*. gen. 154. *Sag*. 258.

There are feveral fpecies referred to this genus by Dr Cullen, *viz*.

1. *Dyfopia* Tenebrarum; 2. *Dyfopia* Luminis.—The former of thefe is properly the *nyctalopia*, or night-blindnefs,

Dysæsthesiæ. blindness, of ancient authors. But amongst both the Greek and Latin writers, there is a direct opposition in the use of this word *nyctalopia*; some saying it signifies "those who *cannot* see by night," and others express by it "those who cannot see during the day, but during the *night*."—The difference in the account of this disorder, as to its appearing in the night or in the day, is reconciled by considering it as of the intermitting kind: the difference then will consist in the different times of its approach; so it may be called *periodical blindness*. Intermittents appearing in a variety of modes, and the success of the bark in some instances of this sort of blindness, both favour the opinion of its being an intermittent disease of the eyes; and this view has accordingly been taken of it by some late writers, particularly in some papers in the London Medical Observations, and Medical Transactions.

3. *Dysopia* Proximorum *(Presbytia)*, or the defect of those who *see only at too great distance*. 4. *Dysopia* Dissitorum *(Myopia)*, or the defect of those who are *shortsighted*.—These are disorders which depend on the original structure or figure of the eye, therefore admit of no cure. The inconveniences arising from them may, however, be in some measure remedied by the help of proper glasses. The former requires the aid of a convex, and the latter of a concave glass.

5. *Dysopia* Lateralis; a defect by which objects cannot be viewed distinctly but in an oblique position.—Thus, in viewing an object placed on the left, they turn their face and eye to the right, and *vice versa*.—This disorder may proceed from various causes both natural and accidental, some of which admit of no remedy. If it be occasioned by a partial adhesion of the eye-lids, the hand of the surgeon is required: if by a transverse position of the pupil, some mechanical contrivance is necessary. If it be owing to an *albugo* covering part of the pupil, or to a film rendering a portion of the cornea opaque, the remedies for these affections are to be here applied.

362 Genus XCV. PSEUDOBLEPSIS.
Imaginary Vision of Objects which do not exist.

Suffusio, *Sauv.* gen. 217. *Sag.* 329.
Phantasma, *Lin.* 73. *Sag.* 289.

This very often takes place when the body is diseased, and then the patient is said to be delirious. Sometimes, however, in these cases, it does not amount to delirium; but the person imagines he sees gnats or other insects flying before his eyes; or sometimes, that every thing he looks at has black spots in it, which last is a very dangerous sign. Sometimes also sparks of fire appear before the eyes; which appearances are not to be disregarded, as they frequently precede apoplexy or epilepsy. Sometimes, however, people have been affected in this manner during life without feeling any other inconvenience. Such a disorder can rarely if ever be cured.

363 Genus XCVI. DYSECŒA.
Deafness, or *Difficulty of Hearing*.

364 Genus XCVII. PARACUSIS.
Depravation of Hearing.

Paracusis, *Sauv.* gen. 159. *Sag.* 265.
Syrigmus, *Sauv.* gen. 219. *Sag.* 231.

The functions of the ear may be injured by wounds, ulcers, or any thing that hurts its fabric. The hearing may likewise be hurt by excessive noise; violent colds in the head; fevers; hard wax, or other substances sticking in the cavity of the ear; too great a degree of moisture or dryness of the ear. Deafness is very often the effect of old age, and is incident to most people in the decline of life. Sometimes it is owing to an original fault in the structure or formation of the ear itself. When this is the case it admits of no cure; and the unhappy person not only continues deaf, but generally likewise dumb, for life. Paracusis.

When deafness is the effect of wounds or ulcers of the ears, or of old age, it is not easily removed. When it proceeds from cold applied to the head, the patient must be careful to keep his head warm, especially in the night; he should likewise take some gentle purges, and keep his feet warm, and bathe them frequently in lukewarm water at bed-time. When deafness is the effect of a fever, it generally goes off after the patient recovers. If it proceed from dry wax sticking in the ears, it may be softened by dropping oil into them; afterwards they must be syringed with warm milk and water.

If deafness proceeds from dryness of the ears, which may be known by looking into them, half an ounce of the oil of sweet almonds, and the same quantity of camphorated spirit of wine, or tincture of asafœtida, may be mixed together, and a few drops of it put into the ear every night at bed-time, stopping them afterwards with a little wool or cotton. Some, instead of oil, put a small slice of the fat of bacon into each ear, which is said to answer the purpose very well.—When the ears abound with moisture, it may be drained off by an issue or seton, which should be made as near the affected parts as possible.

Some, for the cure of deafness, recommend the gall of an eel mixed with spirit of wine, to be dropped into the ear; others, equal parts of Hungary-water and spirit of lavender. Etmuller extols amber and musk; and Brookes says, he has often known hardness of hearing cured by putting a grain or two of musk into the ear with cotton-wool. Where, however, an application with considerable stimulant power is necessary, camphorated oil, with the addition of a few drops of volatile alkaline spirit, may be considered as one of the best. It is proper, however, to begin with a small quantity of the alkali, increasing it as the ear is found to bear it. In some instances, where deafness depends on a state of insensibility in the nerves, electricity, particularly under the form either of sparks or of the electric aura, has been employed with great success. But these and other applications must be varied according to the cause of the disorder.

Though such applications may sometimes be of service, yet they much oftener fail, and frequently they do hurt. Neither the eyes nor ears ought to be tampered with; they are tender organs, and require a very delicate touch. For this reason, what we would chiefly recommend in deafness, is to keep the head warm. From whatever cause this disorder proceeds, this is always proper; and more benefit has often been derived from it alone, in the most obstinate cases of deafness, than from any medicines whatever.

Genus

Dysæsthesiæ

GENUS XCVIII. ANOSMIA.
Defect of SMELLING.

365 Anosmia, *Sauv.* gen. 156. *Lin.* 113. *Vog.* 248. *Sag.* 262.

Causes. Morbid affections in the sense of smelling, may be considered with respect to their causes, as arising from one of two sources; either from some organic affection of the parts here principally concerned, or from a mere atonic state of the parts without any obvious affection. The sense of smelling may be diminished or destroyed by various diseases of the parts; as, the moisture, dryness, inflammation or suppuration of that membrane which lines the inside of the nose commonly called the *olfactory membrane*; the compression of the nerves which supply this membrane, or some fault in the brain itself at their origin. A defect, or too great a degree of solidity, of the small spongy bones of the upper jaw, the caverns of the forehead, &c. may likewise impair the sense of smelling. It may also be injured by a collection of fetid matter in those caverns, which keeps constantly exhaling from them. Few things are more hurtful to the sense of smelling than taking great quantities of snuff.

Cure. When the nose abounds with moisture, after gentle evacuations, such things as tend to take off irritation and coagulate the thin sharp serum may be applied; as the oil of anise mixed with fine flour, camphire dissolved in oil of almonds, &c. The vapours of amber, frankincense, gum-mastic, and benjamin, may likewise be received into the nose and mouth. For moistening the mucus when it is too dry, some recommend snuff made of the leaves of marjoram, mixed with oil of amber, and aniseed; or a sternutatory of calcined white vitriol, 12 grains of which may be mixed with two ounces of marjoram-water and filtrated. The steam or vapour of vinegar thrown upon hot iron received up the nostrils is likewise of use for softening the mucus, opening obstructions, &c.

If there be an ulcer in the nose, it ought to be dressed with some emollient ointment, to which, if the pain be very great, a little laudanum may be added. If it be a venereal ulcer, it is not to be cured without mercury. In that case, the solution of the corrosive sublimate in brandy may be taken, as directed in the gutta serena. The ulcer ought likewise to be washed with it; and the fumes of cinnabar may be received up the nostrils.

If there be reason to suspect that the nerves which supply the organs of smelling are inert or want stimulating, volatile salts, strong snuffs, and other things which occasion sneezing, may be applied to the nose. The forehead may likewise be anointed with balsam of Peru, to which may be added a little of the oil of amber.

366

GENUS XCIX. AGEUSTIA.
Defect of TASTING.

Ageustia, *Sauv.* gen. 157. *Sag.* 263.
Ageustia, *Lin.* 114.
Apogeusis, *Vog.* 449.

Cause. This disease also may arise either from an organic affection, or an atonic state of the parts. The taste may be diminished by crusts, filth, mucus, aphthæ, pellicles, warts, &c. covering the tongue; it may be depraved by a fault of the saliva, which, being discharged into the mouth, gives the same sensation as if the food which the person takes bad really a bad taste; or it may be entirely destroyed by injuries done to the nerves of the tongue and palate. Few things prove more hurtful either to the sense of tasting or smelling than obstinate colds, especially those which affect the head.

Ageustia.

Cure. When the taste is diminished by filth, mucus, &c. the tongue ought to be scraped, and frequently washed with a mixture of water, vinegar, and honey, or some other detergent. When the saliva is vitiated, which seldom happens unless in fevers or other diseases, the curing of the disorder is the cure of this symptom. To relieve it, however, in the mean time, the following practices may be of use: if there be a bitter taste, it may be taken away by vomits, purges, and other things which evacuate bile: what is called a *nidorous taste*, arising from putrid humours, is corrected by the juice of citrons, oranges, and other acids: a salt taste is cured by plentiful dilution with watery liquors: an acid taste is destroyed by absorbents and alkaline salts, as powder of oyster-shells, salt of wormwood, &c.

When the sensibility of the nerves which supply the organs of taste is diminished, the chewing of horse-radish, or other stimulating substances, will help to recover it.

GENUS C. ANÆSTHESIA. 367
Defect of the Sense of FEELING.

Sauv. gen. 161. *Lin.* 218. *Vog.* 267.

Causes, &c. This sense may be hurt by any thing that obstructs the nervous influence, or prevents its being regularly conveyed to the organs of touching, as pressure, extreme cold, &c. It may likewise be hurt by too great a degree of sensibility, when the nerve is not sufficiently covered by the cuticle or scarf-skin, or where there is too great a tension of it, or it is too delicate. Whatever disorders the functions of the brain and nerves, hurts the sense of touching. Hence it appears to proceed from the same general causes as palsy and apoplexy, and requires nearly the same method of treatment.

In a *stupor*, or defect of touching, which arises from an obstruction of the cutaneous nerves, the patient must first be purged; afterwards such medicines as excite the action of the nerves, or stimulate the system, may be used. For this purpose, the spirit of hartshorn, either by itself or combined with essential oils, horse-radish, &c. may be taken inwardly; the disordered parts, at the same time, may be frequently rubbed with fresh nettles or spirit of sal ammoniac. Blisters and sinapisms applied to the parts will likewise be of use; and also warm bathing, especially in the natural hot-baths.

ORDER II. DYSOREXIÆ. 368

SECT. I. *APPETITUS ERRONEI.*

Morositates, *Sauv.* Class VIII. Order II. *Sag.* Class XIII. Order II.

Anorexiæ

Pathetici, *Lin.* Clafs V. Order II.
Hyperæfthefes, *Vog.* Clafs VII.

369 Genus CI. BULIMIA.
Insatiable Hunger, or *Canine Appetite.*

Bulimia, *Sauv.* gen. 223. *Lin.* 79. *Sag.* gen. 335.
Bulimus, *Vog.* 296.
Addephagia, *Vog.* 297.
Cynorexia, *Vog.* 298.

This difeafe is commonly owing to fome fault in the ftomach, by which the aliments are thrown out too foon; and unlefs the perfon be indulged in his defire for eating, he frequently falls into fainting fits. Sometimes it is attended with fuch a ftate of the ftomach, that the aliment is rejected by vomit almoft immediately after being fwallowed; after which the appetite for food returns as violent as ever. But there are many circumftances which feem to render it probable that it more frequently arifes from a morbid condition of the fecreted fluid poured into the ftomach, by means of which the aliment is diffolved. When the activity of this fluid is morbidly increafed, it will both produce too fudden a folution of the folid aliment, and likewife operate as a powerful and peculiar ftimulus to the ftomach, giving an uneafy fenfation, fimilar to that which takes place in natural hunger. Such things are proper for the cure as may enable the ftomach to perform its office: chalybeates and other tonics will generally be proper. In fome, brandy drunk in a morning has been ufeful; and frequent fmoking tobacco has relieved others. Oil, fat meat, pork, opiates, and in fhort every thing which in a found perfon would be moft apt to pall the appetite, may alfo be ufed as temporary expedients, but cannot be expected to perform a cure In fome, the pylorus has been found too large; in which cafe the difeafe muft have been incurable.

370 Genus CII. POLYDIPSIA.
Excessive Thirst.

Polydipfia, *Sauv.* gen. 224. *Lin.* 80. *Vog.* 275. *Sag.* 336.

This is almoft always fymptomatic; and occurs in fever, dropfy, fluxes, &c. The cure is very generally obtained only by the removal of the primary difeafe; and it is beft palliated by the gradual introduction of diluents: But when thefe are contraindicated, it may often be fuccefsfully obviated by fuch articles taken into the mouth as have effect in augmenting the flow of faliva.

371 Genus CIII. PICA.
Longing, or *Falfe Appetite.*

Pica, *Sauv.* gen. 222. *Sag.* 334.
Citta, *Lin.* 78.
Allotriophagia, *Vog.* 299.
Malacia, *Vog.* 300.

The pica is alfo very generally fymptomatic of other difeafes, as of worms, chlorofis, pregnancy, &c.; and is therefore chiefly to be combated by the removal of the primary affection. It may, however, be obferved, that peculiar longings occurring in certain dif-

cafes, as for example in fevers, often point out a natural cure. The indulgence of fuch appetites to a moderate degree is feldom productive of any inconvenience, and often followed by the beft confequences.—Hence there are fome practitioners who think that fuch craving fhould very generally be indulged; particularly when the patient can affign no reafon whatever for fuch particular longings, but is merely prompted by an uncommon and inexplicable defire. Pica.

Genus CIV. SATYRIASIS. 372

Satyriafis, *Sauv.* gen. 228. *Lin.* 81. *Sag.* 340.

Satyriafis is a violent defire of venery in men, even fo that reafon is depraved by it. The pulfe is quick, and the breathing fhort; the patient is fleeplefs, thirfty, and loathes his food; the urine is evacuated with difficulty, and a fever foon comes on. Thefe fymptoms, however, are probably not fo much the confequence of fatyriafis, as merely concomitant effects refulting from the fame caufe. And indeed this affection is moft frequently the concomitant of a certain modification of infanity. The nature and caufe of this affection are in moft inftances very little afcertained; but as far as we are acquainted with the treatment, it agrees very much with the affection next to be mentioned, which, of the two, is the moft common occurrence.

Genus CV. NYMPHOMANIA. 373
Furor Uterinus.

Nymphomania, *Sauv.* 229. *Sag.* 341.
Satyriafis, *Lin.* 81.

The *furor uterinus* is in moft inftances either a fpecies of madnefs or an high degree of hyfterics. Its immediate caufe is a preternatural irritability of the uterus and pudenda of women (to whom the diforder is proper), or an unufual acrimony of the fluids in thefe parts.—Its prefence is known by the wanton behaviour of the patient: fhe fpeaks and acts with unreftrained obfcenity; and as the diforder increafes, fhe fcolds, cries, and laughs, by turns. While reafon is retained, fhe is filent, and feems melancholy, but her eyes difcover an unufual wantonnefs. The fymptoms are better and worfe untill the greateft degree of the diforder approaches, and then by every word and action her condition is too manifeft.—In the beginning a cure may be hoped for; but if it continue, it degenerates into a mania.—In order to the cure, blood-letting is commonly had recourfe to in proportion to the patient's ftrength. Camphor in dofes of 15 or 20 grains, with nitre, and fmall dofes of the tincture of opium, fhould be repeated at proper intervals. Some venture to give cerufa acetata in dofes from three to five grains. Befides bleeding, cooling purges fhould alfo be repeated in proportion to the violence of fymptoms, &c. What is ufeful in maniacal and hypochondriac diforders, is alfo ufeful here, regard being had to fanguine or phlegmatic habits, &c. When the delirium is at the height, give opiates to compofe; and ufe the fame method as in a phrenitis or a mania. Injections of barley-water, with a fmall quantity of hemlock-juice, according to Riverius, may be frequently thrown up into the uterus: this

Dysorexiæ this is called *specific*; but matrimony, if possible, should be preferred. For although this cannot be represented as a cure for the disease when in an advanced state, yet there is reason to believe that it has not unfrequently prevented it where it would otherwise have taken place.

374 GENUS CVI. NOSTALGIA.
Vehement Desire of revisiting one's Country.

Nostalgia, *Sauv.* gen. 226. *Lin.* 83. *Sag.* 338.

This is to be reckoned a species of melancholy; and unless it be indulged, it very commonly proves not only incurable but even fatal. Although it cannot be considered as altogether peculiar to any nation, yet it is observed to be much more frequent with some than with others; and it has particularly been remarked among Swiss soldiers in the service of foreign states.

SECT. II. *APPETITUS DEFICIENTES.*

Anepithymiæ, *Sauv.* Clafs VI. Ord. II. *Sag.* IX. Ord. II.
Privativi, *Lin.* Clafs VI. Order III.
Adynamiæ, *Vog.* Clafs VI.

GENUS CVII. ANOREXIA.
Want of Appetite.

Anorexia, *Sauv.* gen. 162. *Lin.* 116. *Vog.* 279. *Sag.* 268.

The anorexia is symptomatic of many diseases, but seldom appears as a primary affection; and it is very generally overcome only by the removal of the affection on which it depends.

376 GENUS CVIII. ADIPSIA.
Want of Thirst.

Adipsia, *Sauv.* gen. 163. *Lin.* 117. *Vog.* 281. *Sag.* 269.

This by Dr Cullen is reckoned to be always symptomatic of some distemper affecting the *sensorium commune*.

377 GENUS CIX. ANAPHRODISIA.
Impotence to Venery.

Anaphrodisia, *Sauv.* gen. 164. *Sag.* 270.
Atecnia, *Lin.* 119.
Agenesia, *Vog.* 283.

For this, see the article IMPOTENCE in the alphabetical order.

378 ORDER III. DYSCINESIÆ.

379 GENUS CX. APHONIA.
Loss of Voice.

Aphonia, *Sauv.* gen. 166. *Lin.* 115. *Vog.* 253. *Sag.* 272.

The loss of voice may proceed from various causes. If one of the recurrent nerves, which are formed by the *par vagum* and the *nervus accessorius*, and reach the larynx, be cut, the person is capable of only as it were a half-pronunciation; but if both be cut, the speech and voice are both lost. The loss of speech happening in hysteric patients is also called *aphonia*; but more properly that loss of speech is thus named which depends on some fault of the tongue. Aphonia.

Seeing that the motion of any part is destroyed, or lessened at least, by the interception of the nervous fluid in its passage thither, and that the nerves destined for the motion of the tongue arise principally from the fifth pair, it appears that the seat of this disorder is in the said fifth pair of nerves, and that the immediate cause is a diminution or total destruction of the nervous power in them. Hence a palsy of the tongue, which is either antecedent or subsequent to hemiplectic or apoplectic disorders, demand our utmost attention.

If an aphonia appears alone, it generally bespeaks an approaching hemiplegia or apoplexy; but if it succeed these disorders, and is complicated with a weak memory and a sluggishness of the mental powers, it threatens their return. That aphony usually terminates the best which proceeds from a stagnation of serous humours compressing the branches of the fifth pair of nerves, which run to the tongue; but it is no less afflictive to the patient, and is very obstinate of cure.

Other causes of this disorder are, the striking in of eruptions on the skin, a congestion of blood in the fauces and tongue, obstructed periodical evacuations in plethoric habits, spasmodic affections, worms, a crumb of bread falling into the larynx, fear, too free an use of spirituous liquors; also whatever destroys the ligaments which go from the arytænoid to the thyroid cartilages, will destroy the voice.

The *prognostics* vary according to the cause or causes. That species which is owing immediately to spasms, soon gives way on the removal of them. If a palsy of the tongue be the cause, it is very apt to return, tho' relieved, but often continues incurable.

In order to the *cure*, we must endeavour first to remove whatever obstructs the influx of the nervous fluid into the tongue, and secondly to strengthen the weak parts. These general intentions, in all cases, being regarded, the particular causes must be removed as follows:

If worms be the cause, antispasmodics may give present relief; but the cure depends on the destruction or expulsion of the animals themselves. In case of a congestion of blood about the head, bleeding and nitrous medicines are to be used.—That species of aphony which remains after the shock of an hemiplegia or apoplexy, requires blisters to be applied to the nape of the neck; other means are rarely effectual.—If spasmodic constrictions about the fauces and tongue be the cause, external paregorics are of the greatest service, anodyne antispasmodics may be laid under the tongue, and the feet bathed in warm water; carminative clysters also are useful.—When a palsy of the tongue produces this complaint, evacuations, according to the patient's habit, must be made, and warm nervous medicines must be externally applied, and internally administered; blisters also should be placed between the shoulders.—In case of repelled cuticular eruptions, sudorifics should be given, and the patient's drink should be warm. The spiritus ammoniæ succinatus, or vinum antimonii, may be employed either in combination

Iſcineſiæ tion with other articles or by themſelves, and given, at proper diſtances of time, in the patient's drink, or on a lump of ſugar.—Sometimes the ſerum flows ſo rapidly to the fauces and adjacent parts, in a ſalivation, as to deprive the patient of all power to ſpeak; in this caſe diaphoretics and laxatives, with a forbearance of all mercurials, are the ſpeedieſt remedies.

380 GENUS CXI. MUTITAS.
DUMBNESS.

Mutitas, *Sauv.* gen. 165. *Vog.* 257. *Sag.* 271.

Dumb people are generally born deaf; in which caſe the diſtemper is incurable by medicine: though even ſuch people may be taught not only to read and write, but alſo to ſpeak and to underſtand what others ſay to them. For ſome obſervations on the method in which this has been accompliſhed, we may refer the reader to the article DUMBNESS in the alphabetical order. But in theſe caſes, admitting of cure in the manner above alluded to, the dumbneſs proceeds principally, if not ſolely, from the deafneſs. For when it proceeds from a defect of any of the organs neceſſary for ſpeech, the tongue for inſtance, it is always incurable; but if it ariſe from a palſy, the medicines applicable in that caſe will ſometimes reſtore the ſpeech.

381 GENUS CXII. PARAPHONIA.
Change in the Sound of the VOICE.

Paraphonia, *Sauv.* gen. 168.
Cacophonia, *Sag.* 274.
Raucedo, *Lin.* 146.
Raucitas, *Vog.* 252.
Aſaphia, &c. *Vog.* 250, 251, 254, 255, 256.

The voice may be changed from various cauſes. In males it becomes much more hard about the time of puberty; but this can by no means be reckoned a diſeaſe. In others it proceeds from a catarrh, or what we call a *cold*; it ariſes alſo from affection of the noſe and palate, as polypi, ulcers, &c. in which caſe the cure belongs properly to SURGERY. In ſome it ariſes from a laxity of the *velum pendulum palati* and glottis, which makes a kind of ſnoring noiſe during inſpiration. The cure of this laſt caſe is to be attempted by tonics and ſuch other medicines as are of ſervice in diſeaſes attended with laxity.

382 GENUS CXIII. PSELLISMUS.
Defect in PRONUNCIATION.

Pſelliſmus, *Sauv.* gen. 167. *Lin.* 138. *Sag.* 273.
Traulotis, &c. *Vog.* 258, 259, 260, 261.

Of this diſeaſe (if ſuch it may be called), there are many different kinds. Some cannot pronounce the letter S; others labour under the ſame difficulty with R, L, M, K. &c.; while ſome who can with ſufficient eaſe pronounce all the letters, yet repeat their words, or the firſt ſyllables of them, in ſuch a ſtrange manner, that they can ſcarce be underſtood. Very frequently theſe defects ariſe entirely from habit, and may then be got the better of by thoſe who have the reſolution to attempt it; as we are told that Demoſthenes the celebrated orator got the better of a habit of ſtammering by declaiming with pebbles in his mouth. Sometimes, however, pronunciation may be impeded by a wrong conformation of the tongue or organs of ſpeech; and then it cannot by any pains whatever be totally removed. Pſelliſmus.

GENUS CXIV. STRABISMUS. 383
SQUINTING.

Strabiſmus, *Sauv.* gen. 116. *Lin.* 304. *Vog.* 514. *Sag.* 222.

Deſcription. This diſeaſe ſhows itſelf by an uncommon contraction of the muſcles of the eye; whereby the axis of the pupil is drawn towards the noſe, temples, forehead, or cheeks, ſo that the perſon cannot behold an object directly.

Cauſes, Prognoſis, &c. I. This diſeaſe may proceed from cuſtom and habit; while in the eye itſelf, or in its muſcles, nothing is preternatural or defective.

Thus children by imitating thoſe that ſquint, and infants by having many agreeable objects preſented to them at once, which invite them to turn one eye to one and the other eye to another, do frequently contract a habit of moving their eyes differently, which afterwards they cannot ſo eaſily correct. Infants likewiſe get a cuſtom of ſquinting by being placed obliquely towards a candle, window, or any other agreeable object capable of attracting their ſight: for though, to ſee the object, they may at firſt turn both eyes towards it; yet, becauſe ſuch an oblique ſituation is painful and laborious, eſpecially to the moſt diſtant eye, they ſoon relax one of the eyes, and content themſelves with examining it with the eye that is next it; whence ariſes a diverſity of ſituation and a habit of moving the eyes differently.

In this caſe, which may admit of a cure if not too much confirmed, it is evident, that objects will be ſeen in the ſame place by both eyes, and therefore muſt appear ſingle as to other men; but becauſe, in the eye that ſquints, the image of the object to which the other eye is directed falls not on the moſt ſenſible and delicate part of the retina, which is naturally in the axis of the eye, it is eaſy to ſee that it muſt be but faintly perceived by this eye. Hence it is, that while they are attentive in viewing any object, if the hand be brought before the other eye, this object will be but obſcurely ſeen, till the eye change its ſituation, and have its axis directed to it; which change of ſituation is indeed very eaſy for them, becauſe it depends on the muſcles of the eyes, whoſe functions are entire; but, by reaſon of the habit they have contracted of moving their eyes differently, the other eye is at the ſame time frequently turned aſide, ſo that only one at a time is directed to the object.

That all this may be the better perceived; for an object, cauſe them to look at the image of the upper part of your noſe in a plain mirror, while you ſtand directly behind them, to obſerve the direction of their eyes.

II. The *ſtrabiſmus* may proceed from a fault in the firſt conformation, by which the moſt delicate and ſenſible part of the retina is removed from its natural ſituation, which is directly oppoſite to the pupil, and is placed a little to a ſide of the axis of the eye; which obliges them to turn away the eye from the object they

Dyscinesiæ they would view, that its picture may fall on this most sensible part of the organ.

When this is the case, the disease is altogether incurable, and the phænomena that arise therefrom differ in nothing from the phænomena of the former case, excepting only that here, 1. The object to which the eye is not directed will be best seen; which is the reverse of what happens when this disease arises barely from habit and custom. 2. No object will appear altogether clear and distinct: for all objects to which the eye is directed, by having their image painted in the retina at the axis of the eye, where it is not very sensible, will be but obscurely seen; and objects that are placed so far to a side of the optic axis as is necessary for making their image fall on the most sensible and delicate part of the retina, must appear a little confused, because the several pencils of rays that come therefrom fall too obliquely on the crystalline to be accurately collected in so many distinct points of the retina; though it must be acknowledged, that this confusion will, for the most part, be so small as to escape unobserved.

III. This disease may proceed from an oblique position of the crystalline, where the rays that come directly to the eye from an object, and that ought to converge to the point of the retina, which is in the axis of the eye, are, by reason of the obliquity of the crystalline, made to converge to another point on that side of the visual axis where the crystalline is most elevated; and therefore the object is but obscurely seen, because its image falls not on the retina at the axis of the eye, where it is most sensible: But the rays that fall obliquely on the eye, will, after refraction, converge to this most sensible part of the retina; and, by converging there, must impress the mind with a clearer idea of the object from whence they came. It is for this reason that the eye never moves uniformly with the other, but turns away from the object it would view, being attentive to the object to which it is not directed. When this is the case, it is in vain to expect any good from medicine.

The symptoms that naturally arise from it are, 1. The object to which the eye is directed will be but faintly seen, because its image falls on the retina where it is not very sensible. 2. The object to which the eye is not directed, by having its image painted on the retina at the axis of the eye, will be clearly perceived. But, 3. This same object must appear somewhat indistinct, because the pencils of rays that flow from it are not accurately collected in so many distinct points in the retina, by reason of their oblique incidence on the crystalline. 4. It must be seen, not in its proper place, but thence translated to some other place situated in the axis of vision. And, 5. Being thus translated from its true place, where it is seen by the other eye that does not squint, it must necessarily appear double; and the distance between the places of its appearance will be still greater, if the crystalline of the other eye incline to the contrary side.

IV. This disease may arise from an oblique position of the cornea; which, in this case, is generally more arched and prominent than what it is naturally.

Strabismus. When the eye has this conformation, no object to which it is directed can be clearly seen, because its image falls not on the retina at the axis of the eye; and therefore the eye turns aside from the object it would view, that its image may fall on the most sensible part of the retina.

When the strabismus proceeds from this cause, the prognostic and the phænomena that attend it will be much the same as in the case immediately preceding; from which nevertheless it may be distinguished by the obliquity of the cornea, which is manifest to the senses and if the cornea be also more arched and prominent than what it is naturally, which is commonly the case, the eye will also be short-sighted.

V. This want of uniformity in the motions of our eyes, may arise from a defect, or any great weakness or imperfection, in the sight of both or either of the eyes; and this, according to Dr Porterfield, is the most common cause of this disease. The prognostic in this case is the same with that of the disease from which it proceeds.

VI. Another cause from which the strabismus may proceed, lies in the muscles that move the eye. When any of those muscles are too short or too long, too tense or too lax, or are seized with a spasm or paralysis, their equilibrium will be destroyed, and the eye will be turned towards or from that side where the muscles are faulty.

In this case, the disease frequently yields to medicine, and therefore admits of favourable prognostic; excepting only when, by a fault in the first conformation, any of the muscles are longer or shorter than their antagonist; in which case, if ever it should happen, no medicine can be of any use.

As to what concerns the optical phænomena, they are the same here as in case first: only when the disease commences not till, by custom and habit, the uniform motion of the eyes has been rendered necessary, all objects do for some time appear double; but in time they appear single.

Lastly, This want of uniformity in the motions of our eyes may proceed from a preternatural adhesion or attachment to the eye-lids: of this we have an instance in Langius. And that the same thing may also be occasioned by a tumor of any kind within the orbit, pressing the eye aside, and restraining it from following the motions of the other, is so evident, that instances need not be brought to prove it. Here also the case may admit of a favourable prognostic; and as for what concerns the optical phænomena, they must be the same as in the case immediately preceding.

The *cure*, in confirmed cases, is to be effected by mechanical contrivances, by which the person may be obliged to look straight upon objects, or not see them at all; or at least that he may see with uneasiness and confusedly when he squints. In the 68th volume of the Philosophical Transactions we have an account of a confirmed case of squinting of a very uncommon kind. The patient was a boy of five years old, and viewed every object which was presented to him with but one eye at a time. If the object was presented on his right side, he viewed it with his left eye; and if it was presented on his left side, he viewed it with his right eye. He turned the pupil of that eye

Dyſcineſiæ eye which was on the ſame ſide with the object in ſuch a direction that the image of the object might fall on that part of the bottom of the eye where the optic nerve enters it. When an object was held directly before him, he turned his head a little to one ſide, and obſerved it with but one eye, viz. that moſt diſtant from the object, turning away the other in the manner above deſcribed; and when he became tired of obſerving it with that eye, he turned his head the contrary way, and obſerved it with the other eye alone, with equal facility; but never turned the axis of both eyes on it at the ſame time. He ſaw letters which were written on bits of paper, ſo as to name them with equal eaſe, and at equal diſtances, with one eye as with the other. There was no perceptible difference in the diameters of the iriſes, nor in the contractility of them after having covered his eyes from the light. Theſe obſervations were carefully made by writing ſingle letters on ſhreds of paper, and laying wagers with the child that he could not read them when they were preſented at certain diſtances and in certain directions.

As from theſe circumſtances it appeared that there was no defect in either eye, which is frequently the caſe with perſons who ſquint, and hence that the diſeaſe was ſimply a depraved habit of moving his eyes, the diſeaſe ſeemed capable of a cure. A paper gnomon was made for this purpoſe, and fixed to a cap; and when this artificial noſe was placed over his real noſe, ſo as to project an inch between his eyes, the child, rather than turn his head ſo far to look at oblique objects, immediately began to view them with that eye which was next to them. But having the misfortune to loſe his father ſoon after this method was begun to be followed, the child was neglected for ſix years, during which time the habit was confirmed in ſuch a manner as ſeemed to leave little room to hope for a cure. The ſame phyſician, however, being again called, attempted a ſecond time to remove the deformity by a ſimilar contrivance. A gnomon of thin braſs was made to ſtand over his noſe, with a half circle of the ſame metal to go round his temples: theſe were covered with black ſilk, and by means of a buckle behind his head, and a croſs-piece over the crown of his head, this gnomon was worn without any inconvenience, and projected before his noſe about two inches and an half. By the uſe of this machine he ſoon found it leſs inconvenient to view all oblique objects with the eye next to them inſtead of the eye oppoſite to them.

After this habit was weakened by a week's uſe of the gnomon, two bits of wood, about the ſize of a gooſe-quill, were blackened all but a quarter of an inch at their ſummits; theſe were frequently preſented to him to look at, one being held on one ſide the extremity of his black gnomon, and the other on the other ſide of it. As he viewed theſe, they were gradually brought forwards beyond the gnomon, and then one was concealed behind the other: by theſe means, in another week, he could bend both his eyes on the ſame object for half a minute together; and by continuing the uſe of the ſame machine, he was in a fair way of being cured when the paper was written.

Dr Darwin, who writes the hiſtory of the above caſe, adds, that all the other ſquinting people he had occaſion to attend, had one eye much leſs perfect than the other: theſe patients, ſays he, are certainly curable by covering the beſt eye many hours in a day; as by a more frequent uſe of the weak eye, it not only acquires a habit of turning to the objects which the patient wiſhes to ſee, but gains at the ſame time a more diſtinct viſion; and the better eye at the ſame time ſeems to loſe ſomewhat in both theſe reſpects, which alſo facilitates the cure. Strabiſmus.

GENUS CXV. CONTRACTURA. 384
Contractions of the LIMBS.

Contractura, *Sauv.* gen. 119. *Lin.* 299. *Sag.* 225.
Obſtipitas, *Sauv.* gen. 11.
Caput obſtipum, *Vog.* 513.
Digitium, *Vog.* 221.

The contraction of various muſcles of the body is generally the conſequence of ſome other diſeaſe, as the rheumatiſm, gout, ſcurvy, or palſy, eſpecially that ſpecies of the latter which follows the *colica Pictonum*. It is exceedingly difficult of cure; though the warm medicinal waters are much recommended, and have ſometimes done great ſervice. Of late electricity has been found to perform ſurpriſing cures in this way.

ORDER IV. APOCENOSES. 385

Apocenoſes, *Vog* Claſs II. Ord. II.
Fluxus, *Sauv.* Claſs IX. *Sag.* Claſs V.
Morbi evacuatorii, *Lin.* Claſs IX.

GENUS CXVI. PROFUSIO. 386
FLUX of BLOOD.

Profuſio *Lin.* 239.
Hæmorrhagia, *Vog.* 81. *Boerh.* 218.

The diſeaſe commonly known by the name of *bloody flux*, is the putrid or contagious dyſentery, a diſeaſe which has already been treated of. But independent of the diſcharge of blood which then takes place, hæmorrhagy may take place from the alimentary canal as well as from other parts of the ſyſtem. In ſuch inſtances, however, if we except the place from which the diſcharge occurs, the phenomena are very much the ſame as in menorrhagia, hæmoptyſis, and other hæmorrhagies already treated of; while the diſeaſe is to be combated on the ſame principles and by the ſame remedies.

GENUS CXVII. EPHIDROSIS. 387
Exceſſive SWEATING.

Ephidroſis, *Sauv.* gen. 258. *Sag.* gen. 194.
Sudor, *Lin.* 208.
Hydropedeſis, *Vog.* 121.

This is generally ſymptomatic; and occurs in almoſt all fevers, but eſpecially in the latter ſtages of the hectic. Sometimes it is a primary diſeaſe, ariſing merely from weakneſs; and then eaſily admits of a cure by the uſe of the Peruvian bark, the cold bath, and other tonics.

GENUS CXVIII. EPIPHORA. 388
FLUX of the LACHRYMAL HUMOUR.

Epiphora, *Sauv.* gen. 259. *Lin.* 172. *Vog.* 99. *Sag.* 195.

THIS by Sauvages is deſcribed as an involuntary effuſion effufion of tears without any remarkable itching, heat, or pain. It follows long-continued ophthalmias; or it may be occafioned by immoderate ftudy, or any thing that weakens the eyes: hence it comes on about the age of 50 years, when the eyefight naturally becomes weak. It in general grows worfe in the winter-time, and is very hard to cure Some authors recommend purgatives, and blifters on the nape of the neck, in order to draw off the abundant humours; but as the difeafe evidently proceeds from weaknefs, it would rather feem proper to purfue a contrary method. Sauvages recommends to the patients to abftain from ftudy, wine, and falted meats; and alfo to avoid fmoke or wind, and at night to foment the eyes with an infufion of four cloves in two ounces of proof-fpirit.—Hungary water, rofe water with white vitriol diffolved in it, &c. have alfo been recommended.

389 GENUS CXIX. PTYALISMUS.
SALIVATION.

Ptyalifmus, *Sauv.* gen. 261. *Lin.* 176. *Vog.* 103. *Sag.* 197.

A falivation is often fymptomatic, but rarely a primary difeafe. Dr Cullen is of opinion, that when the latter happens to be the cafe, it arifes from laxity; and then is to be cured by aftringents and tonics. In the Medical Tranfactions we have the following account of a falivation brought on by a foreign fubftance irritating one of the parotid glands.

In the month of April 1751, a young lady about the age of 16 years, of a delicate habit, but fubject to no particular complaints, perceived the beginning of a difeafe which afterwards proved moft obftinate and loathfome, *viz.* an inceffant fpitting. The quantity of this difcharge was different at different times, varying from one pint to two pints and an half in 24 hours. As to its quality, it feemed to be no other than the ordinary fecretion of the falival glands. By fo large and conftant an evacuation, her ftrength became extremely impaired, and the moft efficacious medicines had proved ufelefs. She had taken large quantities of the Peruvian bark, both alone and combined with preparations of iron: and afterwards the fetid gums, opium, amber, alum, and the Neville-Holt-water, had in fucceffion been given her. In the mean time an exact regimen had been prefcribed: fhe had been ordered to ride conftantly; and to confine herfelf to a mucilaginous diet, fuch as veal, calve's feet, &c. Likewife a gently opening medicine had now and then been interpofed. The difeafe ftill continued unaltered, fhe had afterwards tried the *tinctura faturnina*; and had, at the fame time, been encouraged to chew the Peruvian bark, and to fwallow the faliva But all thefe attempts had been vain; and after fhe had taken fome or other of the medicines above mentioned until the end of September 1753, namely, above two years, it appeared to her phyfician, Sir George Baker, unreafonable to expect relief in fuch a cafe from any internal medicines whatever.

He now conceived a fufpicion, that fome extraneous body having accidentally found its way into the *meatus auditorius*, might poffibly be the caufe of this extraordinary fecretion, by keeping up a continued irritation in the parotid glands. With this view he examined her ears, and extracted from them a quantity of fetid wool. How, or when, it came thither, no account could be given.

To this fubftance he attributed the beginning of the falivation, notwithftanding that the difeafe did not immediately abate on the removal of the wool; as it appeared to be no improbable fuppofition that the difcharge might be continued by the force of habit, though the original caufe no longer remained.

It feemed therefore expedient to introduce fome other habit, in the place of the increafed fecretion of faliva; which habit might afterwards be gradually left off With this intention, he prevailed on the patient to chew perpetually a little dry bread, and to fwallow it with her fpittle. In a few weeks, it became neceffary for her to chew the bread only at certain hours in the day; and thus, after two months, fhe became entirely free from a moft difguftful and tedious diforder.

It is worthy of obfervation, that, at firft, the fwallowing of fo much faliva frequently occafioned a naufea; and that then, for a few hours, fhe was obliged to fpit it out as ufual; and that, during the greateft part of the time, when fhe chewed the bread, fhe had a ftool or two every day more than common.

GENUS CXX. ENURESIS. 390
An involuntary FLUX *of* URINE.

Enurefis, *Sauv.* gen. 264. *Lin.* 195. *Vog.* 113. *Sag.* 200.

THIS is a diftemper which frequently affects children, otherwife healthy, when afleep; and is extremely difagreeable. Often it is merely the effect of lazinefs, and may be driven off by proper correction; but fometimes it proceeds from an atony or weaknefs of the fphincter of the bladder. Many ridiculous cures have been prefcribed for it, and among the reft fieldmice dried and powdered. Tonics are frequently of ufe; but fometimes the diftemper proves obftinate, in fpite of every thing we can ufe. In the London Medical Obfervations we find blifters much recommended in this difeafe, when applied to the region of the os facrum. A girl of 13 years of age had been fubject to an enurefis for four years. She could retain her water but a very little while in the day-time, but it flowed continually in the night. She had taken Peruvian bark and elixir of vitriol in confiderable quantities; alfo Valerian and the volatile julep, without effect. She was feverely threatened, as the phyfcian fufpected it might arife from a bad habit; but this producing no effect, a blifter was applied to the os facrum, which in 24 hours totally removed the difeafe. A man aged 32, having been feized with an incontinence of urine and palfy of the lower extremities in confequence of taking a quack medicine, was cured of the incontinence of urine in 24 hours by one blifter, and of the palfy itfelf by another. A woman of 50 having been feized with an enurefis and paralytic affection of the right thigh and leg in confequence of a ftrain, was cured of both by a fingle blifter. Several other cafes are there mentioned, by which the power of blifters in removing this diftemper feems to exceed that of every other medicine whatever.

Apyrenoses Gonorrhœa

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Genus CXXI. GONORRHOEA.

Gonorrhœa, *Sauv.* gen. 268. *Lin.* 200. *Vog.* 118. *Sag.* 204.

The gonorrhœa is a flux of viscid matter of various colours, from the urethra in men and the vagina in women. It commonly proceeds from coition with a person infected with the venereal disease, and is one of the most common forms under which that disease shows itself.

Description. The first symptoms of the disease in men are commonly a sensation at the end of the penis not unlike a flea-bite, together with a fulness of the lips of the urethra, and some degree of tension in the penis, the urinary canal feeling as if tightened, and the urine flowing in a small and unequal stream: a little whitish mucus is to be seen about the orifice of the urethra, and oozing from it when slightly pressed, especially if the pressure be made on the spot where the soreness is most felt. The discharge soon increases in quantity, and varies in its colour according to the degree of inflammation. The patient feels a sensation of heat and pain in evacuating his urine, particularly at certain spots of the urethra, and above all towards its orifice; and the involuntary erections to which he is subjected from the stimulus, particularly when warm in bed, occasion a distortion or curvature of the penis, attended with exquisite pain. When the inflammation is violent, the glans appears tumid and transparent, the tension extends through the whole of the penis, the perinæum is affected with swelling and redness, and even the loins, buttocks, and anus, sympathize and afford a very uneasy sensation. Sometimes the prepuce inflames about the end of the penis, and cannot be drawn back, occasioning what is called a *phymosis*; at other times, as in the *paraphymosis*, it remains in an inflamed state below the glans, so that it cannot be drawn forwards; and, if the stricture and inflammation be violent, may terminate in gangrene. Now and then, especially when there is a phymosis, we may perceive a hard chord extending along the back of the penis. This is an inflamed lymphatic, and may be considered as a prelude to a bubo. When, however, a bubo does appear, almost universally some ulceration is previously to be discovered about the præputium, or glans penis; which gives ground to presume that some other contagious matter besides that of gonorrhœa may have been applied to the urethra. For it is certain that matter capable of communicating the contagion of gonorrhœa to a female, is often copiously applied to the whole glans penis of a male for several days together, without giving either ulceration or bubo.

In mild cases, the seat of the disease is in the urethra, not far from its orifice; but it frequently happens that the virus insinuates itself much higher up, so as to affect Cowper's glands, the prostate, and parts very near to the neck of the bladder.

In the generality of cases, the inflammation goes on increasing for several days, commonly for a week or a fortnight; after which the symptoms begin to abate; and the running, when left to itself, gradually lessens in quantity, and becomes whiter and thicker, till at length it totally stops. The colour of the mucus, however, is by no means a certain guide in these cases: for in many patients it is of a yellowish, and sometimes of a greenish hue to the very last; but in general it becomes more consistent towards the close of the disease.

In women, the external parts of generation being fewer and more simple, the disease is less complicated than in men. Sometimes the vagina only is affected; and when this happens, the symptoms are very trifling: but in general it comes on with an itching and sensation of heat as in the other sex; and is attended with inflammation of the nymphæ, inside of the *labia, clitoris, caruncula myrtiformes*, the orifice and sometimes the whole of the *meatus urinarius*. Very often the deep-seated glands of the vagina are affected, and it is sometimes difficult to distinguish the discharge of a gonorrhœa from that of the fluor albus.

Causes, &c. Many ingenious arguments have of late been advanced to prove, that the gonorrhœa and the lues venerea are different affections, originating from two distinct species of virus; and this controversy still, perhaps, remains to be decided by future facts. Certain it is, that in 19 of 20 cases of gonorrhœa, no symptom whatever of syphilis appears; and that the disease readily admits of cure without having recourse to those remedies which are universally requisite for combating the contagion of syphilis. It is by no means wonderful, that in some cases both contagions, supposing them different, should be communicated at the same time. Nay, cases are by no means rare, where the contagion of itch, though essentially different from both, has been communicated with either. But as undeniable proof that the contagion in both cases is precisely the same, it has been alleged by some, that the matter of a chancre introduced into the urethra will generate a gonorrhœa, and that the discharge from a gonorrhœa will produce chancre, bubo, and every other symptom of syphilis. On the other hand, however, it is contended, that when experiments of this nature are conducted with the greatest accuracy, the matter of syphilis uniformly produces syphilis, and that of gonorrhœa, gonorrhœa only. Without pretending to decide on which of these experiments the greatest dependence is to be put, we may only observe, that while an almost inconceivably small portion of syphilitic matter applied to the glans penis, from connection with an infected female, infallibly produces syphilis if it be not speedily removed, the matter of gonorrhœa, in every instance of that disease, is applied to the whole surface of the glans penis for many days together without producing almost any bad effect whatever. From this, therefore, there is ground for inferring, either that it is not capable of being absorbed, or that if absorbed it is innocent.

But while there have been disputes with regard to the peculiar nature of the matter in gonorrhœa, there have also been controversies with respect to the source from whence it is derived. While some suppose it to be principally purulent matter arising from ulcerations, others assert that no such ulceration is ever produced in the urethra by gonorrhœa. They contend that the increased secretion in these cases is exactly similar to what happens in the catarrh. But the comparison will by no means hold good in every particular: in the latter the whole membrane of the nose is equally irritated; whereas in the gonorrhœa, only particular parts

Apocenoses of the urethra seem to be affected. The disease, in the generality of cases, seldom extends more than an inch and a half along that canal, and in many is confined (at least in the beginning) to a small spot about an inch from the extremity of the glans. The discharge is produced from that part of the urethra where the pain is felt; and the patient, when he voids his urine, feels no smarting till it reaches the inflamed spot: but as the disorder increases, the inflammation affects a greater number of points, just in the same manner as chancres affect different parts of the glans. It might be supposed that dissection would at once clear up this matter, and put an end to the dispute; but this is far from being the case. Dr Simmons has seen several urethras opened in persons who had a gonorrhœa at the time of their death: in three of them the surface of the urethra, as in the cases related by Morgagni, appeared for some way down of a slight red colour, and in all of them was covered with mucus; but without any appearance of ulceration, except in two dissections at Paris, in which most of the gentlemen present were convinced that they saw evident marks of it: but Dr Simmons says that the appearances were to him not sufficiently satisfactory to enable him to decide with certainty on the subject. On the other hand, when we consider that the discharge in a gonorrhœa is sometimes tinged with blood, and that when this happens a little blood-vessel is no doubt ruptured, we can have no reason to doubt that an ulceration may, and sometimes does, happen in these cases; especially as we often observe an excoriation near the orifice of the urethra. It is certain, that wherever there is considerable inflammation, there will be danger of ulceration. Besides, from a neglected or badly-treated gonorrhœa, we often see fistulas *in perineo*, and other ulcers of the urethra, penetrating through its substance, and affording a passage to the urine. And there can be no doubt that slight ulcerations of this canal often occur, and are afterwards perfectly obliterated, in a similar manner to what happens in the papillæ of the tongue, the tonsils, &c. Such an obliteration will the more readily take place in a part like the urethra, defended with mucus, and not exposed to the air, which is known to have no little effect in hardening a cicatrix.

But whether ulcers take place or not, whether the virus of gonorrhœa be precisely of the same kind with that which gives syphilis, or of a different kind, there is reason from the phenomena of the disease to conclude, that the matter first acts by mixing with the mucus at the extremity of the urethra; and that from thence it is propagated upwards, particularly where the excretories of mucus are most numerous; and that on the parts to which it is applied, it operates as a peculiar irritating cause. The consequences of this irritation will be inflammation and an increased secretion of mucus; and so far the complaint will be local. In ninety-nine cases of an hundred a local affection of this kind constitutes the whole of the disease; and of this inflammation, ulcerations within the urethra, strictures, and other local affections, may be the consequence. But whether a disease of the habit ever takes place, unless when the contagion of syphilis is communicated with that of gonorrhœa, still remains to be determined by future observations and experiments. Gonorrhœa

Nothing can be more variable than the period at which the disease makes its appearance after infection. Perhaps, at a medium, we may place it between the 4th and 14th day: but in some cases it happens within 24 hours; and in others, not before the end of five or even six weeks: neither of these extremes, however, are common.

From what has been said of the manner in which the contagious matter in gonorrhœa acts, and of the influence it exerts on those parts with which it comes in contact, it follows, that the prevention of gonorrhœa must depend on the removal of the contagious matter as soon as that can be done; and where this is either altogether neglected or not properly accomplished, that the cure must depend on counteracting the inflammation which this contagious matter excites, and the consequences which result from it.

The first of these intentions may be most certainly and most easily accomplished by careful lotion of all the parts to which the contagious matter has any chance of being applied. These parts, at least on the first application of the matter, are readily accessible: for even in men there is no reason to believe that it at first penetrates to any extent in the urethra. This washing of the parts should be performed as soon as possible; because then the matter is both most accessible and least involved with mucus: but although washing cannot be accomplished at an early period, it should not be neglected afterwards; for from the disease uniformly commencing, even when it does not appear till a considerable time after the application of the contagious matter, with a peculiar sense of titillation at the external parts, particularly in men at the extremity of the urethra, there is reason to believe that the contagious matter attached to the mucus may remain latent there for a very considerable time. For the purpose of washing, with a view to the prevention of this disease, recourse may be had to almost any watery fluid, provided it be not so stimulant as to produce bad effects from injuring the parts. Pure water, properly applied, is perhaps one of the best lotions; but there can be no doubt that its power in removing the contagious matter may be somewhat increased by such additions as render it a more powerful solvent of mucus. With this intention, one of the most powerful additions is the vegetable alkali, either in its mild or caustic state. In the latter state it is the most active, but in the former it is most safe; and the *lixiva purificata* of the Edinburgh pharmacopœia, to the extent of half a drachm, dissolved in six or eight ounces of water, is one of the best lotions that can be employed. The purpose of removing the contagion may often also be effectually answered from washing with water impregnated with soap; for there the alkali, though in a caustic state, is prevented from exerting any disagreeable effects, in consequence of its being combined with oily matters.

With the view of preventing gonorrhœa, some have advised, that the alkali either in its mild or caustic state, properly diluted with water, should be injected into the urethra: and there can be no doubt, that by this

Gonorrhœa.

this means the contagious matter, when it has entered the urethra, may be removed. A removal may also be effected by the injection of a weak solution of corrosive sublimate, which seems to act not by dissolving the mucus but by producing an augmented secretion. But at a very early period of the disease, injections are probably unnecessary; and if it has made any considerable progress, they are dangerous: for from the augmented sensibility of the part, even very gentle ones are apt to excite a high degree of inflammation.

There are practitioners who, supposing that the body possesses powers to expel the virus, and that the disease has a certain period to run through its several stages of progress, acme, and decline, are for leaving the cure to nature; or at least content themselves with assisting her by an antiphlogistic regimen, gentle evacuations, and the like.

That in many cases the disorder admits of a natural cure, there can be no doubt; the increased secretion of mucus carrying off the virus faster than it is formed, till at length the infection is wholly removed: But it is equally certain, that in every case, by the application of suitable remedies to the inflamed part, we may shorten the duration of the complaint, and abridge the sufferings of the patient, with the same certainty and safety as we are enabled to remove the effects of an ophthalmia or any other local inflammation, by proper topical applications. General remedies, such as occasional blood-letting, a cooling diet, the liberal use of diluting liquors, and mild purges, are by all allowed to be useful, and even necessary. Astruc was of opinion that in these cases blood-letting ought to be repeated five or six times; and there are still many practitioners who depend much on repeated evacuations of this sort for a removal of the inflammation. But there is, perhaps, not one case in ten in which it is at all requisite; and this small number of cases will consist only of the strong and plethoric: in such, when the chordee is frequent and painful, and the pulse hard and full, the loss of from eight to twelve ounces of blood will be beneficial, but it will be seldom necessary to repeat the operation. The inflammation in these cases is kept up by the local stimulus of the virus and the urine; and all that we can expect from venesection is to moderate the pain and the frequency of erection. In persons of a delicate habit, and of an irritable fibre, the evacuation will do no good; but if repeated will certainly be liable to do harm, by increasing irritability, and of course rendering the patient more susceptible of stimulus.

The utility, and even the necessity, of a cooling regimen, are sufficiently obvious; wine and spirituous liquors, spiceries, a fish-diet, much animal-food, and salted and high seasoned dishes of every sort, will constantly add to the complaint. The patient should eat meat only once a-day, and that sparingly. He should abstain from hot suppers. Milk, mild vegetables, and fruit, should constitute the principal part of his diet while the inflammatory symptoms continue. Every thing that tends to excite the venereal imagination should be studiously avoided; for whatever promotes erections of the penis will increase the inflammation, and of course add fuel to the disease. For the same reasons much walking or riding on horseback will be hurtful, from the irritation kept up in the perinæum by such means. Violent exercise of any kind, or any thing that is liable to increase the heat and the momentum of the blood, will of course be improper.

The drinking freely of mild, cooling, mucilaginous liquors, such as linseed-tea, orgeat, whey, milk and water, almond emulsion, and the like, will be extremely useful, by diluting the urine, and preventing its salts from stimulating the urethra. When the heat and pain in making water are very considerable, mucilaginous substances are found to have the best effect, particularly the gum tragacanth. It is a common practice to give equal doses of this gum or gum-arabic and nitre, and to dissolve nitre in the patient's drink, with a view to lessen the inflammation. But in these cases nitre is always improper: it is known to be a powerful diuretic, its chief action being upon the urinary passages; so that the stimulus it occasions will only serve to increase the evil it is intended to alleviate. Cream of tartar, on account of its diuretic quality, will be equally improper. Our view here is not to promote a preternatural flow of urine; for the virus, being insoluble in water, cannot easily be washed away by such means; but our object ought to be, to render the urine that is secreted as mild and as little stimulating as possible.

Mild purges, which constitute another material part of the general remedies, are no doubt extremely useful when exhibited with prudence; but it is well known that the abuse of purgative medicines in this disease has been productive of numerous evils. Formerly it was a pretty general practice to give a large dose of calomel at bed-time, three or four times a-week; and to work it off the next morning with a strong dose of the *pilulæ cocciæ*, or some other drastic purge. This method was persevered in for several weeks: in consequence of which the patient often found himself troubled with an obstinate gleet, and perhaps his constitution materially injured; the effect of such a method being (especially in irritable habits) to weaken the stomach and bowels, and lay the foundation of hypochondrial complaints. Violent purging likewise often occasions strangury, hernia humoralis, and other troublesome symptoms.

The purges employed in these cases should be gentle; such as Rochelle salt, manna, tartarised alkali, and the like. They should be given only in a dose sufficient to procure two or three stools, and be repeated only every two or three days. The daily use of the purgative electuaries that are still given by some practitioners, serves only to keep up a continual irritation on the bladder, and of course to prolong the inflammation.

The topical remedies that are used consist chiefly of different sorts of injections, the ingredients of which are extremely various; but their modes of operation may in general be referred to their mucilaginous and sedative, or to their detergent, stimulating, and astringent qualities. In the hands of skilful practitioners, great advantages may doubtless be derived from the use of these remedies; but, on the other hand, the improper and unseasonable administration of them may prove a source of irreparable mischief to the patient.

We know that mucilaginous and oily injections will tend to allay the local inflammation; and that a sedative

Apocenoses tive injection, such as a solution of opium, will lessen the irritability of the parts, and of course produce a similar effect; the utility of such applications is therefore sufficiently obvious.

A detergent injection, or one that will act upon the mucus of the urethra, increase the discharge of it, wash it away, and with it the venereal virus that is blended with it, can only be used as a prophylactic before the symptoms of infection have made their appearance. But great circumspection is necessary in the use of this kind of injection. If it be too weak, it can be of no efficacy; and if it be too strong, it may prove dangerous to the patient. A suppression of urine has been brought on by the improper use of an injection of this kind. When the symptoms of inflammation have once made their appearance, the stimulus of such an injection must be extremely hazardous. Excoriation of the urethra has but too often been produced by remedies of this sort in the hands of adventurous and unskilful practitioners.

While the inflammation of the urethra continues, every thing that stimulates it must be hurtful. If the injection excites a painful sensation in the urethra, as is but too often the case, it will be liable to produce swelled testicles, difficulty in making water, excoriation, and other effects of increased inflammation: if, by its astringency, the running be checked before the virus that excited the discharge be properly subdued, the patient will be exposed to fresh dangers; and perhaps to a variety of local complaints, such as obstructions in the urethra, and abscesses *in perinæo*, which are well known to be sometimes owing to applications of this sort improperly managed.

When the inflammation has subsided, gently stimulating and astringent injections may be used with safety, and with considerable advantage: for as the inflammation is at first excited by the stimulus of the venereal virus, so when the former begins to lessen, we may be assured that the activity of the latter has abated in proportion; and, in general, when the inflammatory symptoms are entirely removed, it will be found, that the mucus is no longer of an infectious nature, but is merely the effect of an increased secretion and of relaxation. Mild astringents will therefore serve to brace and strengthen the vessels secreting mucus, and in this way will lessen the discharge, and greatly promote the cure. It is certain, that in the greater number of cases, a gonorrhœa, which if treated by internal remedies alone, would continue for five or six weeks, or longer, may, when judiciously treated with injections, be cured in a fortnight, and very often in less time. The great aim, therefore, of the practitioner ought to be at first to make use of such injections only as will tend to lubricate the surface of the urethra, and to counteract and destroy the stimulus of the virus: as the inflammation abates, he may add some gently astringent preparation to a mucilaginous and sedative injection; taking care that its astringency be suited to the state of the disease, and to the irritability of the patient. Amongst a great variety of substances, mercury in different forms is one of those that is the most frequently employed in injections. All these mercurial injections have more or less of astringency; and, according to Dr Simmons, it is solely to this property that we are to ascribe their effects; for the idea of Gonorrhœa their correcting the venereal virus was originally introduced, and has, he thinks, been continued upon mistaken principles

Calomel, mixed with the mucus discharged in a gonorrhœa, has no more power in destroying the infectious properties of that mucus than ceruse or any other preparation would have. A diluted solution of sublimate injected into the urethra, will, like a solution of verdigrise, or blue vitriol, or any other styptic, constringe the mouths of the lacunæ; but this is all that it will do, for it will never lessen the infectious nature of the virus. The same thing may be observed of crude mercury extinguished by means of mucilage, or of mercurial unction, blended with the yolk of an egg, and which, when thrown up into the urethra, will act nearly in the same manner as balsam of copaiva, or any other stimulating injection. The stimulus of calomel, however, has often been found of considerable efficacy; and in women, when the vagina only was affected, after washing the parts well, the cure has been accomplished by rubbing them repeatedly with mercurial ointment.

As the gonorrhœa is only a local affection, it may be inferred, that the internal use of mercury is unnecessary towards the cure. Very often indeed this complaint may be removed without having recourse to mercurials. Sometimes patients have been met with whose general health has been greatly impaired by a long continued use of mercury in such cases, while the original disease, the gonorrhœa, was rendered much worse by it. In some it degenerated into a gleet, that was cured with extreme difficulty; in others it brought on a variety of distressing symptoms. In cases of gonorrhœas, therefore, whenever mercury is administered, it ought to be, not with a view to expedite the cure, but merely to obviate the dangers of syphilis. When the infection is apparently slight, and the inflammation and the symptoms trifling, we may proceed without the assistance of mercury, especially if the patient be of a weak, relaxed, and irritable habit, likely to be injured by mercurial medicines. On the other hand, when the discharge is violent, the inflammation considerable, or the seat of the disease high up in the urethra, it is perhaps the most prudent plan to give mercurials in small doses, and in such forms as seem the best adapted to the constitution of the patient.

The *pilulæ hydrargyri*, as prepared according to the receipts inserted in the last edition either of the London or Edinburgh pharmacopœias, in both of which the mercury is rendered active merely by triture, may perhaps be considered as one of the mildest and most efficacious forms under which mercury can be exhibited by the mouth. Its efficacy will depend on its not irritating the bowels, and so passing off by stool; care must likewise be taken to prevent its affecting the mouth. Of the chemical preparations of mercury, the mildest and least irritating is calomel. It may be given from gr. iss. to gr. iii. at bed time, occasionally interposing a mild purgative to prevent it from salivating; but in general the mercurial pill just mentioned is to be preferred.

When there is no chancre nor bubo, no appearance in short of syphilitic infection, it would be improper

Apocenoses. to adminifter corrofive fublimate, the mercurius calcinatus, or any other of the more acid preparations of mercury.

After a gonorrhœa proceeding from venereal caufes has been removed, another kind of running without pain, called the *gonorrhœa mucofa*, or *gleet*, fometimes remains. Sometimes it arifes from a conftriction and excoriation of the urethra, and frequently it is the effect of an enlargement and difeafed ftate of the proftate. In each of thefe cafes, as the gleet is the effect of irritation, the cure will depend on the removal of the local difeafe that occafions it. But there is another fpecies of gleet that feems to depend chiefly on relaxation. It is in general free from infection, and is moft common in thofe who have had long and frequent gonorrhœas. It is likewife often the effect of a debilitated habit, from fevere purging, or a long continued ufe of mercurials. A difcharge of this kind is more frequent in women than in men; or, at leaft, the fluor albus, after a gonorrhœa, will often be miftaken for a gleet.

When there is no reafon to fufpect remaining contagion, aftringent injections will be of the greateft fervice. It will be neceffary, at the fame time, to attend to the health of the patient, by employing the Peruvian bark, chalybeate waters, cold bathing, and fuch other remedies as will tend to ftrengthen the fyftem: and indeed by the ufe of thefe, particularly by the Peruvian bark, fuch runnings are often fuccefsfully combated in thofe who from apprehenfion of dangerous confequences cannot be prevailed upon to employ injections. When there is no tendency to inflammation, the balfam of copaiva may be prefcribed with advantage in large dofes. Dr Simmons fays he once faw a complaint of this fort removed by applying a blifter to the perinæum, after it had refifted a variety of other remedies. In the Medical Obfervations alfo we have an account of a gleet and incontinence of urine removed at once by a blifter to the os facrum. In general however, the other methods above mentioned will be fufficient to remove it, though fometimes it will continue for a long time in fpite of all our endeavours to check it.—Other kinds of gonorrhœa, in which the femen itfelf is ejected, efpecially during fleep, may be cured by tonics and a mild cooling regimen

392 ORDER V. EPISCHESES.

393 GENUS CXXII. OBSTIPATIO.
COSTIVENESS.

Obftipatio, *Lin.* 166. *Vog.* 128. *Sag.* 221.

Coftivenefs is fometimes occafioned by debility in dyfpeptic perfons, fometimes it is the effect of rigidity, and fometimes it is fymptomatic of the colic. It may proceed from an exceffive heat of the liver; drinking rough red wines, or other aftringent liquors; too much exercife, efpecially on horfeback: it may likewife proceed from a long ufe of cold infipid food, which does not fufficiently ftimulate the inteftines. Sometimes it is owing to the bile not defcending to the inteftines, as in the jaundice; and at other times it proceeds from difeafes of the inteftines themfelves, as a palfy, fpafms, tumors, a cold dry ftate of the inteftines, &c. Obftipatio.

Exceffive coftivenefs is apt to occafion pains of the head, vomiting, colics, and other complaints of the bowels. It is peculiarly hurtful to hypochondriac and hyfteric perfons, as it generates wind and other diftreffing fymptoms.

Perfons who are generally coftive fhould live upon a moiftening and laxative diet; as roafted or boiled apples, pears, ftewed prunes, raifins, gruels with currants, butter, honey, fugar, and fuch like. Broths with fpinage, leeks, and other foft pot-herbs, are likewife proper. Rye-bread, or that which is made of a mixture of wheat and rye together, ought to be eat. No perfon troubled with coftivenefs fhould eat white bread alone, efpecially that which is made of fine flour. The beft bread for keeping the belly foluble is what in fome parts of England they call *meflin*. It is made of a mixture of wheat and rye, and is very agreeable to thofe who are accuftomed to it.

Coftivenefs is increafed by keeping the body too warm, and by every thing that promotes the perfpiration; as wearing flannel, lying too long a-bed, &c. Intenfe thought, and a fedentary life, are likewife hurtful. All the fecretions and excretions are promoted by moderate exercife without doors, and by a gay, cheerful, fprightly temper of mind.

The drink fhould be of an opening quality. All ardent fpirits, auftere and aftringent wines, as port, claret, &c. ought to be avoided. Malt liquor that is fine and of a moderate ftrength is very proper Buttermilk, whey, and other watery liquors, are likewife proper, and may be drank in turns, as the patient's inclination directs.

Thofe who are troubled with coftivenefs ought, if poffible, to remedy it by diet, as the conftant ufe of medicines for that purpofe is attended with many inconveniences, and often with bad confequences. In time the cuftom becomes neceffary, and generally ends in a total relaxation of the bowels, indigeftion, lofs of appetite, wafting of the ftrength, and death.

The learned Dr Arbuthnot advifes thofe who are troubled with coftivenefs to ufe animal-oils, as frefh-butter, cream, marrow, fat broths, &c. He likewife recommends the expreffed oils of mild vegetables as olives, almonds, piftaches, and the fruits themfelves; all oily and mild fruits, as figs; decoctions of mealy vegetables; thefe lubricate the inteftines; fome faponaceous fubftances which ftimulate gently, as honey, hydromel, or boiled honey and water, unrefined fugar, &c.

The doctor obferves, that fuch lenitive fubftances are proper for perfons of dry atrabilarian conftitutions, who are fubject to aftriction of the belly and the piles, and will operate when ftronger medicinal fubftances are fometimes ineffectual; but that fuch lenitive diet hurts thofe whofe bowels are weak and lax. He likewife obferves, that all watery fubftances are lenitive; and that even common water, whey, four milk, and buttermilk, have that effect:—That new milk, efpecially affes milk, ftimulates ftill more when it fours on the ftomach; and that whey, turned four, will purge ftrongly:—That moft part of fruits are likewife laxative; and that fome of them, as grapes, will throw

Epischeses such as take them immoderately, into a cholera morbus, or incurable diarrhœa.

When the body cannot be kept open without medicine, gentle doses of rhubarb may be taken twice or thrice a-week. This is not near so injurious to the stomach as aloes, jalap, or the other drastic purgatives so much in use. Infusions of sena and manna may likewise be taken, or half an ounce of tartarised alkali dissolved in water-gruel. About the size of a nutmeg of lenitive electuary taken twice or thrice a-day, generally answers the purpose very well.

394 Genus CXXIII. ISCHURIA.
Suppression of *Urine*.

Ischuria, *Sauv.* gen. 293. *Lin.* 167. *Vog.* 129. *Sag.* 212. *Home's* Clinical Experiments, sect. xv.

This distemper is distinguished into various species, according as the seat of it is in the kidneys, the ureters, the bladder, or the urethra; and hence these species are named *renalis*, *ureterica*, *vesicalis*, and *urethralis*.

395 1. *Ischuria renalis*, or a suppression of urine from an affection of the kidneys, happens but rarely; however, Dr Home in his Clinical experiments describes such a case. In the end of December 1774, a man of a full habit, aged 35, was seized with shivering, coldness, and severe cough. Three days after, his urine appeared high-coloured, was passed with pain, and in small quantity. About the 8th of January 1775, he was attacked with violent pains in the small of his back, over the whole abdomen, and in the ankles, with pain in the region of the liver when pressed. A general swelling was afterwards observed all over the body, but mostly in the ankles and abdomen, which last was tense and hard. These were attended with vomiting, bad appetite, and considerable thirst. When he entered the clinical ward (January 21st), the cough, sickness, and vomiting, had gone off, but the suppression of urine remained. The little which he made was passed with his stools, so that Dr Home saw it but once; and then it was pale, and had a white powder at bottom. The pains and swellings, which retained the impression of the finger, continued; he had a head-ach, and a very slow pulse, beating only 48 strokes in a minute. He had taken a great many diuretic medicines before he came in. The day after his reception, he was seized with a spontaneous diarrhœa, which continued during the remainder of his life. Crystals of tartar were exhibited in doses of half an ounce each morning; at bed-time he took 20 drops of tincture of opium with a scruple of nitre, and continued this course for eight days without any increase of urine. The stronger and heating diuretics were then tried, as an infusion of juniper berries and pills of garlic; but they were attended with no sensible advantage. Whenever the pulse became so strong that he could bear bleeding, eight ounces of blood were taken away, which was sizy. This was thrice repeated; he appeared easier after each bleeding, his pulse bore it well, and the swellings and other symptoms abated. The heating diuretics, in this state, were given up; and a mixture of vinegar and nitre was substituted in their place, in each dose of which, taken every two hours, there was a scruple of nitre. Fomentations were applied to the region of the kidneys, Ischuria. and camphorated oil was afterwards rubbed on the part He was ordered the semicupium, which from a deficiency of water in the hospital at that time he got only once; and which then seemed to have a good effect, as he passed a gill of urine when he was in it. Notwithstanding this, however, the disease continually gained ground; he became comatose, delirious, and died ten days after his admission.—On dissection, the kidneys were found of an irregular form; some watery vesicles appeared on their surface, containing black gritty particles like fine sand; and the lower part of the right kidney was considerably inflamed. The pylorus, part of the duodenum, and a considerable part of the small intestines, were much inflamed. In the abdomen were found about five pounds of fluid, and in the cavities of the thorax about half a pound. The lungs were a little inflamed, and full of small tubercles on their surface and in their substance: the heart was large, and a polypus in each ventricle About six ounces of fluid were found in the pericardium: in the brain nothing preternatural appeared, except about an ounce of water in each ventricle.

Dr Home seems to have been at a loss for the remote cause of this suppression of urine, which manifestly had its immediate origin from the kidneys having lost the power of performing their functions. He thinks the inflammation which appeared in the right kidney was scarce sufficient to have occasioned the distemper, as the other would have supplied its place: for which reason also he thinks that the ischuria was owing to a general affection of the system; and that it was of an arthritic nature, the patient having been troubled with complaints of that kind for a long time before.

2. The *ischuria ureterica* is also a rare disease, unless 396
the obstruction proceeds from a stone or clot of blood stopping up the passage. Gravel or stones, indeed, are very frequently formed in the kidneys; and, by falling into the ureters, occasion an ischuria, with violent pain, and symptoms more or less urgent in proportion to the size and shape of the stones. Sometimes it is attended with coldness of the extremities, nausea, vomiting, and spastic constriction of the præcordia, a difficulty of making water, constipation of the belly, difficulty of breathing, stupor of the thigh, retraction of the testicle to the *os pubis*, inquietude, loss of strength, syncope, and convulsion fits. When the violent pain has continued for several days and nights without intermission, and has brought the patient exceeding low, and the suppression of urine is complete, with coldness of the extremities and convulsions of the tendons, death is at hand. Nor is it a good sign when the stone continues long in the ureter; for then the appetite decays, a nausea and retching to vomit supervene, and the patient is consumed with a hectic heat. Sometimes the pain is attended with an inflammation of the stomach and intestines; and sometimes the disease ends in a dropsy of the breast, or lethargy, which soon carry off the patient.

The indications of cure are, to exclude the stone as easily as possible, and prevent the breeding of others. If the patient be of a sanguineous temperament, Sydenham recommends to take away ten ounces of blood

from

Ifchurefes — from the affected fide; and then to give the patient a gallon of poffet-drink in which two ounces of marfhmallow roots have been boiled, injecting at the fame time an emollient glyfter. After the poffet-drink has been vomited up, and the clyfter returned, give a pretty large dofe of an opiate. But if the patient be old or weak, or fubject to nervous affections, bleeding may be omitted, efpecially if his urine at the beginning of the fit be coffee-coloured, and mixed with gravel; but as to other things, the cure is the fame.—Huxham greatly recommends an emollient bath prepared of a decoction of marfh-mallow root, linfeed, fœnugreek feed, and flowers of chamomile, to which may be added a few white-poppy feeds. By the ufe of this bath he fays he has feen the moft cruel fit of the gravel fuddenly ended, when neither copious bleeding nor opiates had the leaft effect. Mild diuretics are alfo of fervice Hoffman recommends dulcified fpirit of nitre as proper to relax the fpaftic ftricture. It is to be taken with fuitable diftilled waters and fyrup of poppies; or in broth, with a few fpoonfuls of oil of fweet almonds. Turpentine glyfters are alfo accounted very ferviceable; and may be prepared of ten ounces decoction of chamomile, with half an ounce of turpentine diffolved in the yolk of an egg, and about as much honey. The *fal diureticus*, or acetated alkali, is much efteemed by fome, when taken along with an opiate. But when the ftone is too big to pafs, Arbuthnot recommends a cool and diluent diet to hinder the further growth of it. Whey, infufion of linfeed, decoction of marfhmallows, and gently refolving diuretics, are alfo proper To put a ftop to the vomiting, *balfamum traumaticum* may be ufed with fuccefs when almoft every other means have failed.

397 3. The *ifchuria veficalis* may arife from a ftone in the bladder; and this indeed is the moft common caufe of it: but there are certain cafes in which, though the ufual quantity of urine, or perhaps more, be paffed, the patient dies from the retention of a ftill greater quantity in the bladder. Of this Dr Home gives the following inftances. A man of 58 years of age, of a ftrong fpare habit, and never fubject to the gravel, had, during the winter of 1777, a cough with expectoration, which went off in the beginning 1778. About the 17th of February 1778 he felt fome difficulty in paffing his urine, and much pain about the region of the bladder. He continued in this way for ten days, after which he became eafier on application of fome medicines. The abdomen then fwelled, and he had pains in his loins and thighs. On the 3d of March he was admitted into the clinical ward: his abdomen was then fwelled and tenfe; and an evident fluctuation was felt, which fome that touched him thought was fonorous and produced by wind. A tumor was difcovered betwixt the navel and fpine of the os ilium on the left fide, which gave him much pain, efpepially when preffed. This tumor became more eafily felt after the fwelling of the abdomen decreafed, feemed round, and very near as large as the head of a child. It appeared very much on the left fide, even when the patient lay on the right, and the tumor then became dependent. He paffed urine frequently, and rather more than in health, as it was computed at four pints a-day. It was always clear, and of a light colour. His body had a ftrong difagreeable fmell; his fkin was dry, belly bound, and his appetite entirely gone, fo that he had hardly taken any food for 12 days. His legs fwelled flightly for fome days in the evening. His pulfe was generally regular, fometimes flower than natural, and fometimes a little quicker; being once felt at 64, and another time at 92. He was often feized, efpecially after eating or drinking, with hiccough; which increafed and lafled till his death. On the 20th day of his difeafe, after fome dofes of fquills, the general fwelling of his abdomen fell, became much fofter, and more diftinctly difcovered the fwelling of the left fide. The next day a vomiting came on; he became delirious, and died the day following. The body being opened, it appeared that the tumor which was fo diftinctly felt on the left fide of the abdomen, was owing to a diftenfion of the bladder with urine. Its fundus reached to about the divifion of the aorta into the iliacs; it entirely filled the pelvis, and contained between five and fix pounds of urine of a pale colour. On examining the external furface, its neck, and the beginning of the urethra, were found to be furrounded with a fcirrhofity, which impeded the evacuation of the urine. The bladder itfelf was much thickened, but not more in one part than another. The ureters entered naturally; but were much thickened in their upper half near the kidney. The kidneys were fomewhat enlarged; particularly the left, which had feveral watery veficles on its external furface. Thefe organs were not in their ufual fituation; but lay clofe on each fide of the fpine, and very near the aorta; fo that the renal veffels were very fhort. What was very fingular, the lower end of each rofe over the fpine, and they were united together by their membranes and fubftances, the aorta paffing beneath the union. The bladder had preffed confiderably on this part; and the peritoneum covering them was confiderably thicker than natural. The lungs adhered every-where to the pleura, and in in fome places very firmly; they were of a loofe texture and black colour; and the veins of the lower extremities were turgid with blood. It does not appear that this patient got any medicines farther than a few dried fquills, which diminifhed the fwellings and brought off much wind. He alfo got a mixture of mufk, and afterwards of opium, for his hiccough; but without fuccefs. His difeafe was miftaken for an afcites; and the catheter was not tried: but in another cafe the ufe of this inftrument was apparently of more fervice than any internal medicines. This laft patient was about 90 years of age, and laboured under fymptoms very fimilar to thofe already mentioned. When admitted into the clinical ward, he had the hypogaftric region fwelled, and difficulty of paffing his water; but without pain, vomiting, or hiccough. He had loft all appetite; was thirfty, and coftive. His pulfe was 110, and weak. In the evening about three Englifh pints of pale clear urine were drawn off by means of the catheter: the next day all the fymptoms were gone off or abated. After this he continued to pafs fome urine, fometimes voluntarily, fometimes involuntarily and infenfibly; but fo much always remained behind, that his bladder was conftantly full, unlefs when the urine was drawn

Ifchuria.

Epiſcheſes off, which was done twice every day. The urine was ſometimes pale, ſometimes of a deep red colour; and once there was ſome blood mixed with it, which perhaps might have been occaſioned by the catheter. About the ſixth day the urine was very putrid, with much purulent-like matter at the bottom, and was paſſed with more pain. About the 11th, the putrid ſmell went off. The next day all the urine paſſed inſenſibly except what was drawn off; and an hiccough, though not very ſevere, had come on. In this way he continued without fever, though frequently troubled with the hiccough, eſpecially during thoſe nights in which the urine had not been drawn off. A month after admittance, the bladder, with the aſſiſtance of the catheter, was almoſt entirely, though inſenſibly evacuated, and the hiccough had left him; he had no other complaint but that of voiding his urine inſenſibly, the natural effect of a ſcirrhous bladder, and which was probably incurable. With this patient the hot bath and mercurials were tried, in order to ſoften the ſcirrhoſity of the bladder, but without effect.

298 4. The *iſchuria urethra's* ariſes from ſome tumour ſtopping up the paſſage of the urethra, and thus hindering the flow of urine. It is an uncommon diſtemper, and generally follows a gonorrhœa. Dr Home gives us an example of this alſo.—The patient was a man of 60 years of age, who had laboured under a gonorrhœa ſix months before, and which was ſtopped by ſome medicines in two or three days. He felt, ſoon afterwards, a difficulty in paſſing his urine, which gradually increaſed. About 10 days before his admiſſion into the clinical ward, it was attended with pains in the glans, and *ardor urinæ;* he had paſſed only about eight ounces the day before his admiſſion, and that with very great difficulty; and the hypogaſtric region was ſwelled and pained. On introducing the catheter, three pounds of urine were drawn off, by which the pain and ſwelling were removed. The inſtrument required force to make it paſs the neck of the bladder, and blood followed the operation; and the finger, introduced into the anus, felt a hard tumour about its neck. He was treated with mercurial pills and ointment, by which the ſwelling about the neck of the bladder ſoon began to decreaſe; but at the ſame time a ſwelling of the right teſticle appeared. He was vomited with four grains of turbith-mineral, which operated gently; and here Dr Home obſerves, that though theſe vomits are little uſed, from a miſtaken notion of their ſeverity, he never ſaw them operate with more violence than other vomits, or than he could have wiſhed. The ſwelling diminiſhed in conſequence of the vomit and ſome external applications; and the cure was completed by bleeding and a decoction of mezereon-root.

399 Genus CXXIV. DYSURIA.

Difficulty of discharging urine.

Dyſuria, *Sauv.* gen. 265. *Lin.* 57. *Vog.* 164 *Sag.* 213.

Stranguria *auctorum.*

A difficulty of making water may ariſe from many different cauſes; as from ſome acrid matter in the blood, cantharides, for inſtance: and hence a ſtrangury very often ſucceeds the application of bliſters. Dyſuria. In many caſes it ariſes from a compreſſion of ſome of the neighbouring parts; of the uterus, for inſtance, in a ſtate of pregnancy. Or it may ariſe from a ſpaſmodic affection of the bladder, or rather its ſphincter; or from an inflammation of theſe parts, or others near them. Hence the diſeaſe is diſtinguiſhed into ſo many ſpecies, the cure of which depends upon the remedies indicated by their different cauſes.

But the moſt common, as well as the moſt dangerous ſpecies is that ariſing from a calculous concretion, or

Stone in the Bladder. 400

Dyſuria calculoſa, *Sauv.* ſp. 12.

The ſigns of a ſtone in the bladder are, pain, eſpecially about the ſphincter; and bloody urine, in conſequence of riding or being jolted in a carriage; a ſenſe of weight in the *perinæum;* an itchineſs of the *glans penis;* ſlimy ſediment in the urine; and frequent ſtoppages in making water; a *teneſmus* alſo comes on while the urine is diſcharged: but the moſt certain ſign is, when the ſtone is felt by the finger introduced into the anus, or by the catheter.

Cauſes, &c. It is not eaſy to ſay what the particular cauſes are that occaſion the apparently earthy particles of the fluids to run together, and form thoſe calculous concretions which are found in different parts of the body, and eſpecially in the organs for ſtraining off and diſcharging the urine.

The gout and ſtone are generally ſuppoſed to have ſome affinity, becauſe gouty people are for the moſt part afflicted with the gravel. But perhaps this is in part owing to their long confinement, and to the lying on the back, which people who labour under the gout are often obliged to ſubmit to; ſince the want of exerciſe, and this poſture, will naturally favour the ſtagnation of groſs matters in the kidneys: beſides, there are many inſtances of peopl ſeverely afflicted with the ſtone for the greateſt part of a long life, who have never had the leaſt attack of the gout.

There is, however, good reaſon for believing, that ſome farther connection takes place between the two diſeaſes; and when treating of the gout we have already given ſome account of the opinion of an ingenious anonymous author, who has endeavoured to prove, that both the one and the other depend on a peculiar acid, the concreting or lithic acid, which is always preſent in blood; and which may be precipitated from thence by various cauſes, ſuch as the introduction of other acids, or the like. When thus precipitated, he ſuppoſes it to produce the whole phenomena of both diſeaſes. The objections we formerly ſtated to his theory of gout, do not equally militate againſt that of calculus; and it is at leaſt certain, from the beſt chemical analyſis, that what are commonly called *urinary calculi*, and have been conſidered as entirely an earthy matter, conſiſt principally of acid in a ſolid ſtate united only with a ſmall proportion of earth or mucus. We may, therefore, whether this hypotheſis be altogether well founded or not, juſtly view lithiaſis as depending on the ſeparation of an acid from the blood.

Whatever may be the particular cauſe of the diſpoſition

Diseases position to *lithiasis*, the kidneys appear to be the most likely places for particles to concrete or run together, because of the great quantity of blood which passes through the renal arteries, and which comes immediately from the heart, fraught with various newly-received matters, that have not undergone much of the action of the vessels, and therefore cannot as yet be supposed to be thoroughly assimilated.

Anatomists who have carefully examined the kidneys in the human subject, particularly M. Bertin, inform us, that there are two sets of *tubuli uriniferi*; the one continued directly from the extremities of the renal artery, and the other springing from that vesicular texture which is conspicuous in the kidneys.

It is in this vesicular part of the kidney that we presume the particles of the concreting matter first stagnate and coalesce: for it is hardly to be supposed, that such solid matters could be allowed to stop in the extremities of the renal arteries, since the blood, and the urine separated from it, must flow through these vessels with great degrees of force and velocity; but in the intermediate vesiculæ the particles may lie, and there attracting each other, soon come to acquire sensible degrees of magnitude, and thus become sand or gravel. As long as this sand or gravel formed in the vesicular part of the kidney lies quiet, there will be no pain or uneasiness, until the concretions become large enough to press either on the adjoining *tubuli*, or on the blood-vessels; then a sense of weight, and a kind of obtuse pain in the loins, will be felt. But when the small pieces of concreting matter shall be dislodged and washed off by the force of the circulating fluids, or loosened by some spasmodic action of the moving fibres in these parts, they will in their passage create pain, raise different degrees of inflammation, or perhaps lacerate some blood-vessels, and cause bloody urine. When these little concretions happen to be detained in the pelvis of the kidney, or any other place where a flow of urine continually passes, they soon increase in size, and become calculi, from the constant accession of particles, which are attracted by the original bit of sand, which thus becomes the nucleus of a stone.

It is an opinion which Hippocrates first advanced, and which has been almost universally adopted by his followers, and has remained till lately uncontroverted, that the stone and gravel are generated by the use of hard water. And from this quality, which the waters of certain springs possess, of depositing a large earthy sediment, either in the aquæducts thro' which they are conveyed, or in the vessels in which they are boiled or preserved, it was conjectured, that in passing through the kidneys, and especially whilst retained in the bladder, they would let fall their grosser particles, which by the continued apposition of fresh matter, connected by the animal gluten, and compacted by the muscular action of that organ, would in time form a calculus sufficiently large to produce a train of the most excruciating symptoms. And this reasoning *à priori* has been supposed to be confirmed by facts and experience; for not to mention the authority of Hippocrates, Dr Lister has observed, that the inhabitants of Paris are peculiarly subject to the stone in the bladder. Nicholas de Blegny has related the history of one who was dissected at Paris, in whom the pylorus, a great part of the duodenum, and the stomach itself, were found incrustated with a stony matter, to the thickness of a finger's breadth. And it is well known, that the water of the river Seine, with which that city is supplied, is so impregnated with calcareous matter, as to incrustate, and in a short time to choak up, the pipes through which it runs. But on the other hand it is objected, that the human calculus is of animal origin, and by chemical analysis appears to bear very little analogy to the stony concretions of water: and though it be allowed, that more persons are cut for the stone in the hospitals at Paris than in most other places; yet upon inquiry it is found, that many of those patients come from different provinces, and from towns and villages far distant from the Seine.

Dysuria.

Dr Percival conjectures, that though this disease may chiefly depend upon a peculiar disposition to concrete in the animal fluids, which in many instances is hereditary, and in no instance can with certainty be imputed to any particular cause; yet hard water is at least negatively favourable to this diathesis, by having no tendency to diminish it. The urine of the most healthy person is generally loaded with an apparently terreous matter, capable in favourable circumstances of forming a calculus; as is evident from the thick crust which it deposits on the sides of the vessels in which it is contained. And it seems as if nature intended by this excretion to discharge all the superfluous salts of the blood, together with those earthy particles, which are either derived from our aliment, and fine enough to pass thro' the lacteals, though insuperable by the powers of circulation, or which arise from the abrasion of the solids, or from the dissolution of the red globular part of our fluids. Now water, whether used as nature presents us with it, or mixed with wine, or taken under the form of beer or ale, is the great diluter, vehicle, and menstruum, both of our food, and of the saline, earthy, and excrementitious parts of the animal juices. And it is more or less adapted to the performance of these offices, in proportion to its degree of purity. For it must appear evident to the most ordinary understanding, that a menstruum already loaded, and perhaps saturated with different contents, cannot act so powerfully as one which is free from all sensible impregnation. Nor is this reasoning founded upon theory alone; for it is observed, that Malvern water, which issues from a spring in Worcestershire remarkable for its uncommon purity, has the property of dissolving the little sabulous stones which are often voided in nephritic complaints. And the solution too, which is a proof of its being complete, is perfectly colourless. Hence this water is drunk with great advantage in disorders of the urinary passages. And during the use of it, the patient's urine is generally limpid, and seldom deposits any sandy sediment. Yet notwithstanding this appearance of transparency, it is certainly at such times loaded with impurities, which are so diluted and dissolved as not to be visible. For it is attended with a strong and fetid smell, exactly resembling that of asparagus. Hoffman mentions a pure, light, simple water in the principality of Henneberg, in Germany, which is remarkable for its efficacy in the stone and gravel; and a water of similar virtues was discovered not many years ago

Epifchefes ago in the black foreft, near Oftcrod, which upon examination did not afford a fingle grain of mineral matter. Indeed it is worthy of obfervation, that moft of the fprings which were formerly held in great efteem, and were called *holy wells*, are very pure, and yield little or no fediment.

Dr Percival informs us that a gentleman of Manchefter, who had been long fubject to nephritic complaints, and often voided fmall ftones, was advifed to refrain from his own pump-water, which is uncommonly hard, and to drink conftantly the foft water of a neighbouring fpring; and that this change alone, without the ufe of any medicine, has rendered the returns of his diforder much lefs frequent and painful. A lady alfo, much affected with the gravel, was induced by the perufal of the firft edition of Dr Percival's Effay, to try the effect of foft water; and by the conftant ufe of it remained two years entirely free from her diforder.

In nephritic cafes, diftilled water would be an excellent fubftitute for Malvern water, as the following experiment evinces.

Two fragments of the fame calculus, nearly of equal weight, were immerfed, the one in three ounces of diftilled water, the other in three ounces of hard pump-water. The phials were hung up clofe together in a kitchen-chimney, at a convenient diftance from the fire. After 14 days maceration, the calculi were taken out, and carefully dried by a very gentle heat. The former, *viz.* that which had been immerfed in diftilled water, was diminifhed in its weight a grain and a half; the latter had loft only half a grain.

It is the paffage of thefe calculi from the kindeys down into the bladder, which occafions the pain, vomiting, and other fymptoms, that conftitute what is ufually termed a *fit of the gravel* or *ftone*.

When an inflammation is actually raifed, the difeafe is known by the name of *nephritis*, and has been already treated of.

As foon as the ftone paffes through the ureter, and falls into the bladder, the pain and other nephritic fymptoms ceafe; and every thing will remain quiet, either till the ftone be carried into the urethra, or until it has remained long enough in the bladder to acquire weight fufficient to create new diftrefs.

If a ftone happens to be fmooth and of a roundifh form, it may lie in the bladder and acquire confiderable bulk before it can be perceived by the patient; but when it is angular, or has a rugged furface, even though it may be fmall in fize, yet it feldom fails to raife pain, and occafion bloody urine, or the difcharge of a flimy fluid, with tenefmus, and difficulty in making water.

There have been various attempts made to diffolve the ftone; and there are certainly fome articles which have this effect when applied to them out of the body; but the almoft total impoffibility of getting thefe conveyed to the kidneys, renders it extremely doubtful whether a folvent ever will be difcovered. Of all the articles employed for this purpofe, no one perhaps has had greater reputation than fixed alkaline falt in its cauftic ftate, particularly under the form of the *aqua lixivi cauftica*: but this being of a very acrid nature, it requires to be well fheathed by means of fome gelatinous or mucilaginous vehicle. Veal-broth is as convenient as any for this purpofe; and accordingly Dyfuria. it is ufed by thofe who make a fecret of the cauftic alkali as a folvent of calculus.

Mr Blackrie, who has taken much pains in this inquiry, has proved very fatisfactorily, that Chittrick's noftrum is no other than foap-lees given in veal-broth, which the patients fend every day to the doctor, who returns it mixed up with the medicine, in a clofe veffel fecured by a lock.

It is not every cafe, however, that either requires or will bear a courfe of the cauftic alkali. Some calculi are of that foft and friable nature, that they will diffolve even in common water; and there are cafes wherein it appears that the conftant ufe of fome very fimple decoction or infufion of an infignificant vegetable, has brought away large quantities of earthy matter, in flakes which apparently have been united together in layers to form a ftone. Dr Macbride affures us, that a decoction of raw coffee, only 30 berries in a quart of water, boiled till it acquired a deep greenifh colour, taken morning and evening to the quantity of eight or ten ounces, with ten drops of fweet fpirit of nitre, had the powerful effect of bringing away, in the courfe of about two months, as much earthy matter in flakes as filled a large tea-cups. The patient was far advanced in years; and, before he began this decoction, had been reduced to great extremities by the continuance of pain and other diftreffing fymptoms: he was purged occafionally with *oleum ricini*.

Very lately the alkali in a mild ftate, and in a different form, has been much ufed by many calculous patients and with great advantage, under the form of what is called *alkaline aërated water*. For the introduction of this medicine, or at leaft for its extenfive ufe, we are chiefly indebted to that ingenious phyfician Dr William Falconer of Bath. He has lately publifhed an account of the *Aqua Mephitica Alkalina*, or Solution of fixed alkaline falt, faturated with fixable air, in calculous diforders; which contains a number of cafes ftrongly fupporting the benefit to be derived from it. But whether the good effects obtained in thefe inftances are to be explained from its operating as a folvent of calculus, feems to be extremely doubtful. There are indeed cafes in Dr Falconer's treatife, of patients in whom, after ufing it for a confiderable time, no ftone could be detected by founding, although it had been difcovered in that way before they began the employment of it. But in many inftances, the relief has been fo fudden, that it may be concluded, that, notwithftanding the eafe obtained, the calculus ftill remained. In fuch cafes, it probably removed from the urine that quality by which it gives to the calculus frefh accretions, producing that roughnefs of its furface by which it is chiefly capable of acting as a ftimulus. For the diftreffing fymptoms refulting from ftone, are more immediately to be attributed to the inflammatory and fpafmodic affections which it induces; and when its furface is leaft capable of operating as a ftimulus, thefe of courfe will be leaft confiderable It is therefore not improbable, that this remedy produces relief, by preventing frefh additions being made to the calculus.

An infufion of the feeds of *daucus fylveftris* fweetened with honey, is another fimple and much celebrated remedy;

Ischuria. remedy; it has been found to give considerable ease in cases where the stomach could not bear any thing of an acrid nature: the leaves of the *uva ursi* were strongly recommended by the late very celebrated De Haen; and, whatever its way of operating may be, seems to have been productive of good effects in some instances. There is no reason to believe that it has any influence in dissolving calculus; and indeed it seems to be chiefly useful in these instances where ulcerations take place in the urinary passages.

In the Edinburgh Medical Commentaries, vol. 3. we have an account of a method used by the inhabitants of Arabia Petræa for curing the stone, to which they are very much subject, and which the author (an English gentleman of experience and candour) affirms he has seen frequently performed with never-failing success. By means of a catheter they inject into the bladder a weak ley of alkali with the purified fat of a sheep's tail, and a proper quantity of opium all put together. Their catheters are made of gold; and in performing the operation they introduce them quite into the bladder; so that the composition is safely conveyed to the stone without hurting any other part. But when a stone is situated in the kidney, they have no method of cure.

If this method of curing by injection could be safely practised, it would no doubt greatly have the advantage over that of taking alkalies by the mouth, where the medicine is not only much weakened, but the constitution of the patient runs the risk of being greatly injured. But from some experiments mentioned in the second volume of the Medical Transactions, it appears that the human calculi are very different from one another in their natures. Some, for instance, will easily yield to an alkaline menstruum, and very little to an acid; while others are found to resist the alkali, and yield to the acid; and some are of such a compact nature, that they yield neither to acids nor alkalies. An attention, however, to the fragments, scales, or films, which the stone may cast off, and also to the contents and sediment of the urine, may lead to the discovery of what solvent is proper, or whether the stone can be dissolved by any. To use either alkalies or acids improperly may be hurtful; though there may be such kinds of calculi as demand the alternate use of acids and alkalies; nay, there may be found calculi of opposite kinds in the same subject.

In such cases as will not allow us to think of dissolving the stony concretions, and where the only scheme is to palliate and procure ease from time to time, little more can be done than to keep the bowels open occasionally by some gentle cathartic, and wash off as much of the loose gravelly matter and slime as can be removed by such mild diuretic infusions and decoctions as shall be found to pass freely and sit well on the stomach. Persons afflicted with the stone should be careful in respect of their diet, and studiously avoid all heavy and flatulent food, as well as high sauces that are apt to turn rancid. For the same reason, butter and acids are to be shunned; for these often create heartburning, and every thing that offends the stomach raises the nephritic pain; such is the sympathy that obtains between the digestive and the uropoietic organs.

There have been surgeons bold enough to entertain an idea of cutting even into the kidney, in order to extract a stone: this, however, except in cases where an abscess has been formed, and nature points out the way, is merely chimerical. But cutting into the bladder for the same purpose, is an ancient and well-known operation, and often crowned with success. A description, however, of this operation belongs to the article Surgery, to which we refer; and here shall only make this remark, that a surgeon should never begin his operation, until he and his assistants are perfectly satisfied, from actually feeling the stone, that there is one in the bladder; because it has sometimes happened, that when the incision has been made, no stone could be found: and the patient having died in consequence of the operation, and the body being opened, it has appeared that the symptoms which occasioned the belief of a stone in the bladder arose from some other cause.

Dysuria. When a dysuria proceeds from any acrimonious matter thrown into the blood, it may be readily cured by bleeding, emollient clysters, cooling and diluting drinks with gum arabic or gum tragacanth, linseed tea, or the warm bath. When it arises from inflammations of the bladder or parts adjoining to it, we are to regard it only as a symptomatic affection; and the remedies used to remove the primary disease will also remove the dysuria. Sometimes it may arise from an ulcer of the bladder; in which case it is generally incurable; a mild nutritious diet will, however, protract the patient's life.

Genus CXXV. DYSPERMATISMUS. 401
Difficult Emission *of* Semen.

Dyspermatismus, *Sauv.* gen. 260.
Sterilitas, *Lin.* 171. *Sag.* 211.
Agenesia, *Vog.* 283.

This impediment proceeds generally from obstructions in the urethra, either by tumors in itself, or in the cavernous bodies of the penis; in which case the treatment is the same as in the ischuria urethralis; sometimes it is owing to a kind of epileptic fit which seizes the man in the venereal act; and sometimes the semen, when ejected from the proper receptacles, is again absorbed by them, or flows into the bladder, and is expelled along with the urine. The last case is very difficult, or indeed impossible to cure; as proceeding from scirrhi, or other indissoluble tumors of the verumontanum, or the neighbouring parts. In some it proceeds merely from too violent an erection; in which case emollient and relaxing medicines will be of service; and we have an example of a cure performed by means of these in the first volume of the Edinburgh Medical Essays.

Genus CXXVI. AMENHORRHOEA. 402
Suppression *of the* Menses.

Amenorrhœa, *Vog.* 130.
Dysmenorrhœa, *Lin.* 168. *Sag.* 218.

This, with some other symptoms, as dyspepsia, yellowish or greenish colour of the skin, unusual appetites, &c. constitutes the *chlorosis* already treated of, and which seldom or never appears without a suppression of the menses. In Dr Hume's Clinical Experiments

Epiſcheſes

ments we find the virtues of ſeveral emmenagogues ſet forth in the following manner. Chalybeates ſeldom or never ſucceeded: they were always found more uſeful in diminiſhing the evacuation when too violent, than in reſtoring it when deficient. The tincture of black hellebore proved ſucceſsful only in one of nine or ten caſes, though given to the length of four tea-ſpoonfuls a-day, which is double the quantity recommended by Dr Mead. Compreſſion of the crural artery, recommended by Dr Hamilton in the Phyſical and Literary Eſſays, Vol II. proved ſucceſsful only in one of ſix caſes. From the effects produced by this compreſſion, it has the ſtrongeſt appearance of loading the uterus with blood; from the ſenſations of the patient it produces the ſame effects as the approach of the menſes, and has every appearance in its favour; yet does not ſucceed. Dr Hume ſuppoſes that the uterus is more frequently in too plethoric and inflammatory a ſtate; in which caſe, this remedy will do more hurt than in a ſtate of inanition; however, he owns, that in the caſe in which it did ſucceed, the patient was plethoric and inflammatory. Veneſection is recommended as an excellent remedy; the Doctor gives three inſtances of its ſucceſs, and ſays he could give many more. It acts by removing the plethoric ſtate of the uterus, relaxing the fibres, and giving the veſſels full play; ſo that their action overcomes all reſiſtance, and the evacuation takes place. It is of no great moment from whence the blood is taken: the ſaphænic vein will perhaps empty the uterus moſt; but it is difficult to get the proper quantity from it, and the quantity of the diſcharge cannot be ſo well meaſured. The powder of ſavine is a moſt powerful remedy; and proved ſucceſsful in three caſes out of four in which it was tried. It was given to the quantity of half a drachm twice a-day. It is a ſtrong topical ſtimulus, and ſeems improper in plethoric habits. Madder-root, according to Dr Hume, is a very powerful medicine in this diſeaſe; and proved ſucceſsful in 14 out of 19 caſes in which it was tried, being ſometimes exhibited in the quantity of two ſcruples, or a drachm, four times a-day. It has ſcarce any ſenſible effects; never quickens the pulſe, or excites inflammatory ſymptoms: on the contrary, the heat, thirſt, and other complaints abate; and ſometimes theſe ſymptoms are removed, though the diſeaſe be not cured; but when it ſucceeds, the menſes appear from the third to the 12th day.—For other methods of curing the amenorrhœa, ſee CHLOROSIS.

Amenor-rhœa.

WE have now conſidered all thoſe diſeaſes enumerated in Dr Cullen's Noſology, whoſe cure is to be attempted chiefly by internal medicines. The other genera either require particular manual operations, or a very conſiderable uſe of external applications; and therefore properly fall under the article SURGERY. To this, therefore, we ſhall refer the genera which fall under the three laſt orders of this claſs of locales, viz. the *tumores*, *ectopiæ*, and *dialyſes*; and we ſhall add, by way of Appendix, a few obſervations on ſome important affections to which Dr Cullen has not given a place in his ſyſtem.

APPENDIX.

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ANGINA PECTORIS.

DR HEBERDEN was the firſt who deſcribed this diſeaſe, though it is extremely dangerous, and, by his account, not very rare. It ſeizes thoſe who are ſubject to it when they are walking, and particularly when they walk ſoon after eating, with a moſt diſagreeable and painful ſenſation in the breaſt, which ſeems to threaten immediate deſtruction: but the moment they ſtand ſtill, all the uneaſineſs vaniſhes. In all other reſpects the patients at the beginning of this diſorder are well, and have no ſhortneſs of breath; from which the *angina pectoris* is totally different. After it has continued ſome months, the fits will not ceaſe inſtantaneouſly on ſtanding ſtill; and it will come on not only when the patients are walking, but when they are lying down, and oblige them to riſe up out of their beds every night for many months together. In one or two very inveterate caſes, it has been brought on by the motion of a horſe or carriage, and even by ſwallowing, coughing, going to ſtool, ſpeaking, or by any diſturbance of mind. The perſons affected were all men, almoſt all of whom were above 50 years of age, and moſt of them with a ſhort neck and inclining to be fat. Something like it, however, was obſerved in one woman, who was paralytic; and one or two young men complained of it in a ſlight degree. Other practitioners have obſerved it in very young perſons.

When a fit of this ſort comes on by walking, its duration is very ſhort, as it goes off almoſt immediately upon ſtopping. If it comes on in the night, it will laſt an hour or two. Dr Heberden met with one in whom it once continued for ſeveral days; during all which time the patient ſeemed to be in imminent danger of death. Moſt of thoſe attacked with the diſtemper died ſuddenly: though this rule was not without exceptions; and Dr Heberden obſerved one who ſunk under a lingering illneſs of a different nature.

The *os ſterni* is uſually pointed to as the ſeat of this malady; but it ſeems as if it was under the lower part of that bone, and at other times under the middle or upper part, but always inclining more to the left ſide; and in many caſes there is joined with it a pain about the middle of the left arm, which appears to be ſeated in the biceps muſcle.

The appearance of Dr Heberden's paper in the Medical Tranſactions very ſoon raiſed the attention of the faculty, and produced other obſervations from phyſicians of eminence; namely, Dr Fothergill, Dr Wall of Worceſter, Dr Haygarth of Cheſter, and Dr Percival of Mancheſter. It alſo induced an unknown ſufferer under the diſeaſe to write Dr Heberden a very ſenſible letter, deſcribing his feelings in the moſt natural manner; which, unfortunately, in three weeks after the date of this anonymous epiſtle, terminated in a ſudden death, as the writer himſelf had apprehended.

The youngeſt ſubject that Dr Fothergill ever ſaw afflicted

afflicted with this diforder was about 30 years of age; and this perfon was cured. The method that fucceeded with him was a courfe of pills, compofed of the mafs of gum pill, foap, and native cinnabar; with a light chalybeate bitter: this was continued for fome months, after which he went to Bath feveral fucceffive feafons, and acquired his ufual health: he was ordered to be very fparing in his diet; to keep the bowels open; and to ufe moderate exercife on horfeback, but not to take long or fatiguing walks.

The only fymptom in this patient that is mentioned, was a ftricture about the cheft, which came on if he was walking up hill or a little fafter than ordinary, or if he was riding a very brifk trot; for moderate exercife of any kind did not affect him: and this uneafy fenfation always obliged him to ftop, as he felt himfelf threatened with immediate death if he had been obliged to go forward.

It is the fharp conftrictive pain acrofs the cheft, that (according to Dr Fothergill's obfervation) particularly marks this fingular difeafe; and which is apt to fupervene upon a certain degree of mufcular motion, or whatever agitates the nervous fyftem.

In fuch cafes as fell under the infpection of Dr Fothergill, he very feldom met with one that was not attended with an irregular and intermitting pulfe; not only during the exacerbations, but often when the patient was free from pain and at reft: but Dr Heberden obferves, that the pulfe is, at leaft fometimes, not difturbed; and mentions his having once had an opportunity of being convinced of this circumftance, by feeling the pulfe during the paroxyfm.

But no doubt thefe varieties, as well as many other little circumftances, will occur in this difeafe as they do in every other, on account of the diverfity of the human frame; and if thofe which in general are found to predominate and give the diftinguifhing character be prefent, they will always authorife us in giving the name to the difeafe: thus, when we find the conftrictory pain acrofs the cheft, accompanied with a fenfe of ftrangling or fuffocation; and ftill more, if this pain fhould ftrike acrofs the breaft into one or both arms; we fhould not hefitate to pronounce the cafe an *angina pectoris*.

As to the nature of this difeafe, it appears to be purely fpafmodic: and this opinion will readily prefent itfelf to any one who confiders the fudden manner of its coming on and going off; the long intervals of perfect eafe; the relief afforded by wine, and fpirituous cordials; the influence which paffionate affections of the mind have over it; the eafe which comes from varying the pofture of the head and fhoulders, or from remaining quite motionlefs; the number of years for which it will continue, without otherwife difordering health; its bearing fo well the motion of a horfe or carriage, which circumftance often diftinguifhes fpafmodic pains from thofe which arife from ulcers; and laftly, its coming on for the moft part after a full meal, and in certain patients at night, juft after the firft fleep, at which time the incubus, convulfive afthma, and other ills, juftly attributed to the difordered functions of the nerves, are peculiarly apt to return or to be aggravated.

From all thefe circumftances taken together, there can be little doubt that this affection is of a fpafmodic nature: but though it fhould be admitted, that the whole diftrefs in thefe cafes arife from fpafm, it may not be fo eafy to afcertain the particular mufcles which are thus affected.

The violent fenfe of ftrangling or choaking, which fhows the circulation through the lungs to be interrupted during the height of the paroxyfm; and the peculiar conftrictive pain under the fternum, always inclining (according to Dr Heberden's obfervation) to the left-fide; together with that moft diftreffing and alarming fenfation, which, if it were to increafe or continue, threatens an immediate extinction of life; might authorife us to conclude that the heart itfelf is the mufcle affected: the only objection to this idea, and, if it had been conftantly obferved, it would be infurmountable, is, that the pulfe is not always interrupted during the paroxyfm. The appearances in two of the diffections, favour the opinion that the fpafm affects the heart; as in one fubject the left ventricle (and, though it be not mentioned, we may prefume the right one alfo) was found as empty of blood as if it had been wafhed; and in another, the fubftance of the heart appeared whitifh, not unlike a ligament; as it fhould feem, in both cafes, from the force of the fpafm fqueezing the blood out from the veffels and cavities.

If this hypothefis be allowed, we muft conclude that the fpafm can only take place in an inferior degree, as long as the patient continues to furvive the paroxyfm; fince an affection of this fort, and in this part, of any confiderable duration or violence, muft inevitably prove fatal: and accordingly, as far as could be traced, the perfons who have been known to labour under this difeafe have in general died fuddenly.

The diffections alfo fhow, that whatever may be the true feat of the fpafm, it is not neceffary for the bringing of it on, that the heart, or its immediate appendages, fhould be in a morbid ftate; for in three out of the fix that have as yet been made public, thefe parts were found in a found ftate.

On opening the body of the poor gentleman who wrote the letter to Dr Heberden, "upon the moft careful examination, no manifeft caufe of his death could be difcovered; the heart, in particular, with its veffels and valves, were all found in a natural condition."

In the cafe communicated by Dr Percival to the publifhers of the Edinburgh Medical Commentaries, "the heart and aorta defcendens were found in a found ftate." And in Dr Haygarth's patient, "on opening the thorax, the lungs, pericardium, and heart, appeared perfectly found." Not to mention Dr Fothergill's patient (R. M.), in whofe body the only morbid appearance about the heart was a fmall white fpot near the apex. So that the caufe, whatever its nature might have been, was at too great a diftance, or of too fubtile a nature, to come under the infpection of the anatomift. But there was a circumftance in two of the fubjects that is worthy of remembrance; and which fhows that the crafis of the blood, while they were living, muft have been greatly injured, namely, its not coagulating, but remaining of a cream-like confiftence, without any feparation into ferum and craffamentum.

From all that we have feen hitherto publifhed, it does

Angina Pectoris.

does not appear that any considerable advances have been made towards the actual cure of this anomalous spasm.

The very judicious and attentive Dr Heberden (to whom the public are highly indebted for first making the disorder known) confesses, that bleeding, vomits, and other evacuations, have not appeared to do any good: wine and cordials, taken at bed-time, will sometimes prevent or weaken the fits; but nothing does this so effectually as opiates: in short, the medicines usually called *nervous* or *cordial*, such as relieve and quiet convulsive motions, and invigorate the languishing principle of life, are what he recommends.

Dr Wall mentions one patient, out of the 12 or 13 that he had seen, who applied to him early in the disease, and was relieved considerably by the use of antimonial medicines joined with the fetid gums: he was still living at the time the Doctor wrote his paper, (November 1772), and going about with tolerable ease. Two were carried off by other disorders; all the rest died suddenly.

Dr Fothergill's directions are chiefly calculated with the view to prevent the disorder from gaining ground, and to alleviate present distress. Accordingly he enjoins such a kind of diet as may be most likely to prevent irritability: in particular, not to eat voraciously: to be particularly abstemious in respect to every thing heating; spices, spirits, wines, and all fermented liquors: to guard most scrupulously against passion, or any vehement emotions; and to make use of all the usual means of establishing and preserving general health: to mitigate excesses of irritability by anodynes; or pains, if they quicken the circulation: to disperse flatulencies when they distend the stomach, by moderate doses of carminatives; amongst which, perhaps, simple peppermint water may be reckoned one of the safest. But since obesity is justly considered as a principle predisposing cause, he insists strongly on the necessity of preventing an increase of fat, by a vegetable diet, and using every other practicable method of augmenting the thinner secretions.

These were the only means which occurred to the English physicians of opposing this formidable disease: but Dr Smyth of Ireland has, we are told, discovered that it may be certainly cured by issues, of which Dr Macbride gives the following instance.

" *A. B.* a tall, well made man; rather large than otherwise; of healthy parents, except that there had been a little gout in the family; temperate; being very attentive to the business of his trade (that of a watch-maker), led a life uncommonly sedentary; had, from his boyhood upwards, been remarkably subject to alarming inflammations of his throat, which seized him, at least, once in course of the year; in all other respects well.

" In 1767, (then 48 years of age), he was taken, without any evident cause, with a sudden and very dispiriting throbbing under the sternum. It soon afterwards increased, and returned upon him every third or fourth week, accompanied with great anxiety, very laborious breathing, choaking, a sensation of fulness and distension in the head, a bloated and flushed countenance, turgid and watery eyes, and a very irregular and unequal pulse. The paroxysm invaded, almost constantly, while he was sitting after dinner; now and then he was seized with it in the morning, when walking a little faster than usual; and was then obliged to stop, and rest on any object at hand. Once or twice it came on in bed; but did not oblige him to sit up, as it was then attended with no great difficulty in breathing. In the afternoon fits, his greatest ease was from a supine posture; in which he used to continue motionless for some hours, until, quite spent and worn out with anguish, he dropt into a slumber. In the intervals between these attacks, which at length grew so frequent as to return every fourth or fifth day, he was, to appearance, in perfect health.

" Thus matters continued for more than two years; and various antispasmodics were ineffectually tried for his relief. In 1769, there supervened a very sharp constrictory pain at the upper part of the sternum, stretching equally on each side, attended with the former symptoms of anxiety, dyspnœa, choaking, &c. and with an excruciating cramp, as he called it, that could be covered with a crown-piece, in each of his arms, between the elbow and the wrist, exactly at the insertion of the pronator teres; the rest of the limb was quite free. The fits were sometimes brought on, and always exasperated, by any agitation of mind or body. He once attempted to ride on horseback during the paroxysm; but the experiment was near proving fatal to him. The difference of season or weather made no impression upon him. Still, in the intervals, his health was perfectly good; except that his eyes, which before his illness were remarkably strong and clear, were now grown extremely tender; and that his sight was much impaired. He had no flatulency of stomach, and his bowels were regular.

" In this situation, February 22. 1770, he applied to me for assistance. I had seen, I believe, eight or ten of these frightful cases before. Two of the patients dropt dead suddenly. They were men between 40 and 50 years of age, and of a make somewhat fleshy. The fate of the others I was not informed of; or, at least, cannot now recollect.

" Having found the total inefficacy of blisters and the whole class of nervous medicines in the treatment of this anomalous spasm, I thought it right to attempt the correcting or draining off of the irritating fluid in the case now before us. To this purpose, I ordered a mixture of lime-water with a little of the compound juniper-water, and an alterative proportion of Huxham's antimonial wine: I put the patient on a plain, light, perspirable diet; and restrained him from all viscid, flatulent, and acrimonious articles. By pursuing this course, he was soon apparently mended; but after he had persisted regularly in it for at least two months, he kept for some time at a stand. I then ordered a large issue to be opened on each of his thighs. Only one was made. However, as soon as it began to discharge, his amendment manifestly increased. The frequency and severity of the fits abated considerably; and he continued improving gradually, until, at the end of 18 months, he was restored to perfect health; which he has enjoyed, without the least interruption, till now, except when he has been tempted (perhaps once in a twelvemonth) to transgress rules, by making a large meal on salted meat, or indulging himself in ale or rum-punch, each of which never failed to disorder

Angina Pectoris.

order him from the beginning of his illness: and even on these occasions he has felt no more than the slightest motion of his former sufferings; insomuch that he would despise the attack, if it did not appear to be of the same stock with his old complaint. No other cause has had the least ill effect on him.

"Though rum was constantly hurtful, yet punch made with a maceration of black currants in our vulgar corn-spirit, is a liquor that agrees remarkably well with him.

"He never took any medicine after the issue began to discharge; and I have directed that it shall be kept open as long as he lives. The inflammations of his throat have disappeared, for five years past; he has recovered the strength and clearness of his sight; and his health seems now to be entirely re-established."

Dr Macbride, in a letter to Dr Duncan, published in the Edinburgh Medical Commentaries, gives the following additional observations on this disease.

"Within these few weeks I have, at the desire of Dr Smyth, visited, three or four times, a very ingenious man who keeps an academy in this city, of about 34 years of age, who applied to the Doctor for his advice in January last.

"I shall give you his symptoms as I had them from his own mouth, which appear to me to mark his case to be an angina pectoris, and as deplorable as any that I have read of. It was strongly distinguished by the exquisite constrictory pain of the sternum, extending to each of his arms as far as the insertion of the deltoid muscle, extreme anxiety, laborious breathing, strangling, and violent palpitation of the heart, with a most irregular pulse. The paroxysms were so frequent, that he scarcely ever escaped a day, for six or seven years, without one. They were usually excited by any agitation of mind or body, though slight. He had clear intervals of health between the fits. The distemper seems hereditary in him, as he says his father was affected in the same manner some years previous to his death. He has a strong gouty taint, which never showed itself in his limbs; and he has led a life of uncommon sedentariness, from intense application to mathematical studies, attention of mind, and passion, even from his boyish years. These circumstances may, perhaps, account for his having been taken with this disease at so early an age as 17.

"A large issue was immediately opened in each of his thighs. In a month afterwards he began to mend, and has gone on improving gradually. He can now run up stairs briskly, as I saw him do no later than yesterday, without hurt; can bear agitation of mind; and has no complaint, excepting a slight oppression of the breast, under the sternum, which he feels sometimes in a morning, immediately after dressing himself, and which he thinks is brought on by the motion used in putting on his clothes; though for a complete week preceding the day on which I saw him last, he told me that he had been entirely free from all uneasiness, and was exulting that he had not had such an interval of ease for these last seven years.

"Doctor Smyth also showed me, in his *adversaria*, the case of a gentleman who had been under his care in 1760, which he had forgotten when my book went to the press, and which he was reminded of the other day by a visit from his patient. It was a genuine angina pectoris, brought on by a very sedentary life, and great vexation of mind, clearly marked by the exquisite pain under the sternum, that extended acutely to the upper extremities, particularly along the left arm, together with the other symptoms of dyspnoea, anxiety, palpitation of the heart, &c. recited in the case above. The disorder went off in 1762, by large spontaneous discharges from the piles, but returned upon him severely in 1765. Issues in his thighs were then recommended to him, but not made. But, whether it was by the persuasion of some friend, or of his own accord, he went into a course of James's powder, in small alterative doses, combined with a little castor and asafœtida. This he persisted in for about six weeks; in the meanwhile, he had large acrimonious gleetings from the scrotum, and a plentiful discharge of ichor from the anus.—From this time he began to find his complaints grow less and less distressing, and he has now been totally free from them for six years past."

The PUERPERAL, or Child-bed Fever.

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This species of fever, as its name imports, is peculiar to women in child-bed; and is usually the most fatal of all the disorders to which the sex is liable. But, notwithstanding the prevalence of it in all ages, its real nature has remained, to the present time, a subject of much dispute and uncertainty. The critical period of its invasion, when febrile commotions are apt to be excited by various accidents, and the equivocal symptoms which accompany it, have even afforded room for questioning whether it be a primary or a secondary disease. Some writers have considered it as proceeding entirely from an inflammation of the uterus; others have imagined it to be the consequence of an obstruction to the secretion of the milk; while the greater number has been inclined, for reasons equally if not more plausible, to impute it to a suppression of the lochia. If we examine this fever attentively, however, according to its natural course, and independently of all the accidental concomitant symptoms with which it is not essentially connected, we may safely pronounce it to be a primary disease of a particular characteristic, and perhaps not the necessary consequence of any of the causes above-mentioned.

This fever is most generally incident to women within 48 hours after delivery, though it may supervene on the fourth or fifth day, and sometimes considerably later. It is preceded, like other fevers, by a rigor, which is commonly violent; and, when happening during the time of labour, may be confounded with the pains of parturiency. In its earlier stage it is attended with the signs of inflammation. A great pain is felt in the back, hips, and the region of the uterus; which, in the part last mentioned, is accompanied with the sense of heat and throbbing. A sudden change in the quality or quantity of the lochia now also takes place; the patient is frequently troubled with a tenesmus; and the urine, which is very high coloured, is discharged in small quantity and with pain. At the first attack of the fever, the woman is generally seized with a vomiting of porraceous matter, as in the *cholera morbus*, to which disease it then bears a strong resemblance.—But instead of this symptom, there is sometimes only a

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a nauſea, or loathing at the ſtomach, with a diſagreeable taſte in the mouth. The belly ſwells to a conſiderable bulk, and becomes ſuſceptible of painful ſenſations from the ſlighteſt impreſſion. The tongue is generally dry, though ſometimes moiſt, and covered with a thick browniſh fur. When the fever has continued a few days, the ſymptoms of inflammation uſually ſubſide, and the diſeaſe acquires a more putrid form. At this period, if not at the very beginning of the diſorder, a bilious or putrid diarrhœa, of a dangerous and obſtinate nature, ſupervenes, and accompanies it through all its future progreſs; each motion to ſtool being preceded by a temporary increaſe, and followed by an alleviation of pain. The patient uſually nauſeates all kind of food and drink, except what is cold and acidulated. A brown or blackiſh ſordes, the conſequence of putrid exhalations, adheres to the edges of the teeth; a troubleſome hiccough is at length produced, which greatly exaſperates the pains of the abdomen; petechiæ or vibices alſo appear, with ſometimes a miliary eruption, but which produces no mitigation of the diſeaſe. Through the whole courſe of the fever, the patient is affected with great anxiety and dejection of ſpirits.

Such in general is the courſe of the puerperal fever; the ſymptoms of which, however, may be often varied, according to the conſtitution of the patient, the degree of the diſeaſe, and its earlier or later invaſion. When the woman is naturally weak, or her ſtrength has been greatly reduced by immoderate evacuations after delivery; when the diſeaſe is violent, and immediately follows that period; its progreſs and termination are proportionably rapid and fatal. In ſuch unfortunate circumſtances, many have been known to expire within 24 hours from the firſt attack of the diſeaſe; nay, there are ſome inſtances where the rigor has concluded the ſcene. The cataſtrophe, however, is moſt generally ſuſpended for ſome days; and the number of theſe is variable, though the 11th from the commencement of the fever may juſtly be fixed as the period which is uſually deciſive. In whatever ſtage of the diſeaſe an unfavourable termination may happen, it would ſeem as if the commencement of the patient's recovery were not marked by any critical revolution of the fever, as depending on an alteration of the humours; but that the cure is gradually effected, either by a ſpontaneous vomiting, or a long-continued diſcharge by ſtool of that porraceous matter, the exiſtence of which in the ſtomach is uſually evinced at the firſt attack of the diſeaſe. The moſt unfavourable prognoſtic, therefore, ariſes from ſuch a weakneſs of the patient as renders her unable to ſupport ſo tedious an evacuation as that by which the fever is overcome. When the lochia return to their former ſtate, when the ſwelling and tenderneſs of the abdomen abate, and there is a moiſture on the ſkin, we have reaſon to hope for a happy termination of the diſeaſe.

Though the puerperal fever may generally be aſcertained from the deſcription which has been given, and chiefly by that remarkable tenderneſs of the abdomen which particularly diſtinguiſhes it; yet, as ſome of its ſymptoms may be confounded with thoſe ariſing from other diſeaſes, and which require a different method of cure, it will be proper to mention here the circumſtances whereby it may be known with greater certainty.

The pains of the abdomen, attending the child-bed fever, may be diſtinguiſhed from thoſe called *after-pains*, by their uninterrupted continuance through the courſe of the diſeaſe, though ſometimes they ſuffer exacerbations; whereas, in the latter, they often totally intermit. They are alſo diſtinguiſhable by the abſence of fever with concomitant ſymptoms in the one, and their evident exiſtence in the other.

Many circumſtances evince a diſſimilarity between the puerperal and miliary fevers, notwithſtanding the ſymptoms of anxiety and oppreſſion are common to both; inſomuch that the nature of the approaching diſeaſe may be aſcertained at the very commencement of its attack. In the puerperal fever the rigor is more violent, of longer duration, and not interrupted, as in the other. The pulſe is fuller and ſtronger; the ſkin is more hot; and the tongue, whether moiſt or dry, though generally the latter, is not of a white, but browniſh appearance; and the urine is alſo higher coloured. Eruptions, which are critical in miliary fevers, procure no mitigation of the puerperal fever, and cordials generally increaſe it.

When the original attack of the puerperal fever happens to coincide with the febrile commotion which is excited in child-bed women by the milk, the nature of it may at firſt be miſapprehended; but the concomitant ſymptoms, and greater violence of the diſeaſe, muſt in a ſhort time diſſipate ſuch an error.

From all the moſt accurate accounts of this diſeaſe, and from the period at which it generally commences, there ſeems reaſon to conclude, that it owes its riſe more immediately to accidents after delivery. For it is allowed that it may follow a labour under the beſt and moſt favourable circumſtances, though endeavours to dilate the os internum are ſuppoſed frequently to produce it. The more immediate cauſes generally aſſigned by authors are a ſtoppage of perſpiration, the too free uſe of ſpices, and the neglect of procuring ſtools after delivery; ſudden frights, too haſty a ſeparation of the placenta, and binding the abdomen too tight. The putrid appearance, however, which this diſeaſe ſo ſoon aſſumes, affords ground to ſuſpect that the prediſpoſing cauſe of it is a vitiated ſtate of the humours; for it is generally obſerved to be moſt prevalent in an unhealthy ſeaſon, and among women of a weakly and ſcorbutic conſtitution.

Within theſe few years this fever has been treated of by ſeveral writers, moſt of whom have differed from each other in their ſentiments of the nature of the diſeaſe. The firſt in the order of publication is Dr Denman, who ſeems to be of opinion, that it may derive its origin either from a redundancy or too great acrimony of the bile, the ſecretion of which appears to be much interrupted in the time of geſtation. In Dr Manning's treatiſe on this fever, he mentions its being highly probable that ſuch a cauſe contributes greatly to produce the diſeaſe, eſpecially where the putrid tendency of the humours is increaſed by unwholeſome air and diet.

It has likewiſe been the fate of the puerperal fever, that no diſeaſe has more divided the ſentiments of phyſicians in regard to the method of cure. The apparent

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rent indications and contra-indications of bleeding, and other remedies, arifing from the complication of inflammatory and putrid fymptoms; the equivocal appearance of the vomiting and purging, as whether they be critical or fymptomatical; and the different caufes whence fymptoms fimilar to each other may arife in pregnant women; all thefe circumftances concur to involve the fubject in great obfcurity and indecifion. If we carefully attend to the feveral characteriftics of the difeafe, however, fo as to be able to diftinguifh it from every other puerperal complaint, and obferve at the fame time the ufual manner of its declenfion, our judgment may be guided in the method of cure by the falutary efforts of nature. But, in order to obtain a clearer view of the genuine indications, it will be proper to confider them under the feveral lights in which they have been generally agitated by authors.

One of the moft effential points to be afcertained in the cure of the child-bed fever, refpects the propriety of bleeding. A free ufe of the lancet has been generally regarded as the moft fuccefsful expedient in practice; and there are fome inftances of critical hæmorrhagies which would feem to confirm its utility. But Dr Denman thinks we may fafely affirm from experience, that for one who will be benefited by large bleeding, a much greater number will be injured, and that even almoft irretrievably. Nor can this feem furprifing, when we confider the fituation of child-bed women. In moft, the evacuations confequent upon delivery are fufficient to diminifh any undue fuperabundance of the fluids; and if, as frequently happens, the difeafe be produced by too hafty a feparation of the placenta, the confequence of which is generally a very copious difcharge of blood, we can never fuppofe that nature will be affifted in overcoming the febrile commotion, by the farther evacuation of the vital fluid, through the defect of which fhe is now rendered unequal even to the ordinary fupport of the animal œconomy. We may appeal to every practical phyfician, how much he has known the pulfe to fink, and what a train of nervous fymptoms he has obferved to fucceed an excefs of the difcharge abovementioned. Befides, it is an axiom in phyfic, that a remedy which cures any diforder, will always prove fufficient to prevent it; and therefore, if bleeding were the proper cure in the child-bed fever, the difeafe ought to have been prevented by a large evacuation of blood, when that happened previous to its feizure. Experience, however, in this, as in all other difeafes, is the only unerring guide we can follow; and whoever regulates his practice by fact and obfervation, will be convinced that bleeding, efpecially in a larger quantity, is, in general, very far from being attended with fuccefs. Bleeding is feldom proper, except in women of plethoric conftitutions, and in whom the figns of inflammation rife high. Nor even in fuch patients ought it to be repeated without great caution, and the exiftence of ftrong indications. Bleeding, when ufed in proper circumftances, may unqueftionably palliate the fever; but that it often fhortens the duration of it, appears to be a matter of much doubt. On this account the practice becomes ftill more fufpicious and exceptionable, when we confider that by venefection improperly ufed the perfon's ftrength may be fo far reduced as not to fupport the tedious loofenefs by which the difeafe is generally carried off. Though bleeding, however, ought in general to be ufed with great caution, there are certainly many cafes in which it is both neceffary and advantageous.

The genuine nature and effects of the loofenefs in this difeafe, is another controverted point of the higheft importance, and which merits the moft attentive inquiry. Phyficians, obferving that women who die of the puerperal fever are generally molefted with that evacuation, have been induced to confider this fymptom as of the moft dangerous and fatal tendency; and what, therefore, we fhould endeavour by every means to reftrain. In this opinion, however, they would feem to have been governed by too partial an obfervation of facts. For experience certainly authorifes the affertion, that more women appear to have recovered of the child-bed fever, through the intervention of a diarrhœa, than have been deftroyed by that caufe. If it alfo be confidered, that purging is ufually almoft the only fenfible evacuation in the more advanced ftate of the difeafe, and is that which accompanies it to its lateft period, we fhall have the ftrongeft reafon to think that it is critical rather than fymptomatical, and ought therefore to be moderately fupported, inftead of being unwarily reftrained. Nay, the advantage which is found to attend vomiting as well as purging, in the earlier ftage of the difeafe, would feem to evince that the matter difcharged by thefe evacuations is what chiefly foments the difeafe. Emetics and purgatives, therefore, in the opinion of Dr Manning, are the only medicines on which any rational dependence is to be placed in this fever; at leaft, they are certainly fuch as are found the moft fuccefsful. It is an eftablifhed rule in practice, to prefcribe a vomit at the beginning of every fever attended with any naufea or loathing of the ftomach, and where there is not any reafon to apprehend an inflammation of that organ. Nor does the ftate of child-bed women afford the fmalleft ground for prohibiting our recourfe to the fame expedient in anfwering a fimilar indication.

It is fo feldom a phyfician is called during the rigor preceding the puerperal fever, that he has few opportunities of trying the effects of remedies in that early ftate of the difeafe. When fuch occur, however, we fhould endeavour as much as poffible to abate and fhorten that period, as the fucceeding fever is generally found to bear a proportion to the violence and duration of it. For this purpofe, warm diluting drinks fhould be plentifully ufed, with a fmall quantity of volatile fpirits or brandy. When Dr Manning apprehended fuch an accident, he fometimes ordered the nurfe to give immediately a difh or two of warm fackwhey; taking care that it was not too ftrong, which is a caution that ought always to be remembered: for though a freer ufe of the more cordial and fpirituous kinds of liquors might perhaps foon abate the rigor, there is danger to be feared from their influence on the approaching fever, efpecially in women of a ftrong and healthy conftitution. In all cafes, warm applications to the extremities, fuch as heated bricks, towels, or toafted grains in a linen bag, may be ufed with perfect fafety, and fome advantage.

When the hot fit is advanced, the firft thing Dr Manning orders is fome emollient injection, as chickenwater,

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water, or water and milk, which ought to be frequently repeated through the courſe of the diſeaſe. Theſe prove beneficial, not only by promoting the diſcharge from the inteſtines, which ſeems in fact to be the ſolution of the diſeaſe; but alſo by acting as a kindly fomentation to the uterus and adjacent parts. With this intention they are particularly ſerviceable when the lochia are ſuppreſſed. Great care, however, is requiſite in adminiſtering them, on account of the tenderneſs and inflammatory diſpoſition, which at that time render the parts in the pelvis extremely ſuſceptible of pain.

The next ſtep in the method of cure ought to be to promote the diſcharge of the morbid matter both by the ſtomach and inteſtines. This intention is beſt anſwered by the remedy preſcribed by Dr Denman, of which the following is the receipt.

R. Tartar. emetic. gr. ii.
Ocul. cancror. præp. ℈i. Intimè miſceantur.

Of a powder thus prepared, Dr Denman gives from two to ſix grains, and repeats it as circumſtances require. If the firſt doſe do not procure any ſenſible operation, he repeats it in an increaſed quantity at the end of two hours, and proceeds in that manner; not expecting any benefit but from its ſenſible evacuation.

Should the diſeaſe be abated, but not removed, (which ſometimes happens), by the effect of the firſt doſe, the ſame medicine muſt be repeated, but in a leſs quantity, till all danger be over. But if any alarming ſymptoms remain, he does not heſitate one moment to repeat the powder, in the ſame quantity as firſt given; though this be ſeldom neceſſary, if the firſt doſe operates properly.

It is to be obſerved, ſays Dr Denman, that as the certainty of cure depends upon the proper repetition of the medicine, the method of giving it at ſtated hours does not appear eligible. If the firſt doſe produce any conſiderable effect by vomiting, procuring ſtools, or plentifully ſweating, a repetition of the medicine in a leſs quantity will ſeldom fail to anſwer our expectations; but great judgment is required in adapting the quantity firſt given to the ſtrength of the patient and other circumſtances. We are not to expect that a diſeaſe which from the firſt formation carries ſo evident marks of danger, ſhould inſtantly ceaſe, even though a great part of the cauſe be removed.

Frequent doſes of the ſaline draughts ought alſo to be given, which not only promote the evacuation by the inteſtines, but likewiſe increaſe the ſalutary diſcharges of urine and perſpiration. Theſe medicines are particularly ſerviceable in ſubduing the remains of the fever, after its violence has been broken by the more efficacious remedies above mentioned; but when they are uſed even in the decline of the diſeaſe, gentle laxatives of rhubarb and magneſia, as adviſed by Dr Denman, ought to be frequently interpoſed, ſince, as he juſtly obſerves, without ſtools we can do little ſervice.

Notwithſtanding the diſcharge by the inteſtines appears to have the moſt ſalutary effect in this diſeaſe, yet when the ſtomach has not been properly unloaded of offenſive matter, though a great nauſea and ſickneſs had indicated the expediency of ſuch an evacuation at the beginning of the fever, the continuance of the looſeneſs is ſometimes ſo long protracted as in the end to prove fatal. In this alarming ſtate of the diſeaſe, when the ſtools are very frequent and involuntary, and all appearances threaten danger, Dr Denman ſays, that a clyſter of chicken-water injected every one, two, or three hours, or as often as poſſible without fatiguing the patient too much, with the following draught taken every ſix hours, has produced better effects than could be expected.

R. Pulv. rad. ipecacuan. gr. i.
Conſect. Damocrat. ℈i.
Aq. alexiter. ſimp. vel.
Cinnamom. ſimp. ℥iſs. M. f. Hauſtus.

While theſe medicines are uſing, we ſhould endeavour to mitigate the pains of the belly by relaxing applications. During the courſe of the diſeaſe, the patient ought to drink freely of diluting liquors, and abſtain from every thing of a heating quality, unleſs great faintneſs ſhould indicate the uſe of a ſmall quantity of ſome cordial medicine.

Such is the practice recommended in this diſeaſe by Dr Denman. We ſhall now take a curſory view of the ſentiments of ſucceeding writers on this ſubject.

According to Dr Hulme, the proximate cauſe of the puerperal fever is an inflammation of the inteſtines and omentum; for the confirmation of which opinion he appeals to diſſections. He ſuppoſes the chief prediſponent cauſe of the diſeaſe to be the preſſure of the gravid uterus againſt the parts above mentioned. The omentum, ſays he, in the latter ſtage of pregnancy, muſt either be flat, which is its natural ſituation, or be rumpled or carried up by the gravid uterus in folds or doublings. When the latter is the caſe, which he obſerves is probably not ſeldom, the danger of a ſtrangulated circulation will be greater.

Mr White, who has alſo written on this diſeaſe, judiciouſly remarks, that were Dr Hulme's hypotheſis well founded, the diſorder ought rather to take place before delivery, and be immediately removed at that period: That it would likewiſe moſt generally happen to women at their firſt labour, when the abdominal muſcles are leſs yielding, and the pains more violent; the contrary of which is moſt frequently experienced to be the caſe.

It alſo deſerves to be remarked, that, upon Dr Hulme's ſuppoſition, we cannot account for the diſeaſe being more common and fatal in large towns and in hoſpitals, than in the country and private practice, while other inflammatory diſorders are more endemic among thoſe who live in the latter than the former ſituation. Even admitting the friction of the inteſtines and omentum againſt the uterus to be as violent as Dr Hulme ſuppoſes, is it not highly improbable, that any inflammation could be occaſioned by the preſſure of ſuch ſoft ſubſtances upon each other? Or, were this effect really produced, ought not the puerperal fever to be more common and fatal after the moſt laborious deliveries? But this obſervation is not ſupported by experience.

Dr Hulme, in favour of his own hypotheſis, alleges that it gives a ſatisfactory anſwer to the queſtion, "Why all lying-in women have been, and ever will be, ſubject to this diſeaſe?" In this propoſition, however, the Doctor ſuppoſes ſuch an univerſality of the diſeaſe as is not confirmed by obſervation. It is affirmed

firmed upon undoubted authority, that in many parts of Britain the puerperal fever is hardly known; whereas, were it really produced by the caufes he affigns, it would be equally general and unavoidable.

But how peculiar foever this author's fentiments are in refpect of the proximate caufe of this difeafe, they have not led him to any method of cure different from the eftablifhed practice. On this fubject Dr Hulme divides his obfervations into two parts, comprehending under the former the more fimple method of treatment, and under the latter the more complex. He fet out with remarking, that the patient being generally coftive at the beginning of the difeafe, an emollient opening clyfter will often give immediate relief; but if this fhould not prove effectual, recourfe muft be had to cathartics. Thofe which he found anfwer his purpofe beft, were the *fal catharticus amarus*, the *oleum ricini*, emetic tartar, and antimonial wine. When the bowels have been fufficiently cleared and the pain abates, he advifes encouraging a gentle diaphorefis by medicines which neither bind the body nor are heating; fuch as fmall dofes of ipecacuan, emetic tartar, and antimonial wine, combined with an opiate in a moderate dofe, and given once or twice in the courfe of 24 hours; adminiftering the faline draughts in the intermediate fpaces. If, preceding or during this courfe, a ficknefs at ftomach or vomiting attend, he advifes affifting the efforts of nature, by drinking plentifully of camomile tea, warm water, or any other diluting liquor. He concludes with recommending a cooling regimen, reft of body, and tranquillity of mind; prohibiting all kinds of bandage upon the abdomen, and enjoining particular attention to the ftate of the bowels, which ought to be kept gently open for fome time, even after the diforder feems to be gone off, till the patient be quite out of danger.

So much for the fimple treatment: we now proceed to the fecond part, where he defcribes the method of practice when the difeafe is in its more irregular and complicated ftate.

When a diarrhœa accompanies the difeafe, he obferves that it ought by no means to be checked, but fupported, by ordering the patient to drink plentifully of mild aperient liquors. If the pain of the hypogaftric region be attended with ftitches in the fides or over the pit of the ftomach, and a pulfe that refifts the finger pretty ftrongly, he remarks that bleeding would then be highly neceffary: declaring, however, his opinion, that, in the puerperal fever, bleeding is to be confidered only as a fecondary means of relief, though the firft in point of time; that it ought to be advifed with great caution; and that the greateft dependence is always to be placed upon evacuations by ftool.

Mr White, above mentioned, imputes the puerperal fever to a putrefcent difpofition of the humours, contracted during pregnancy, and fomented by the hot regimen commonly ufed by women in child-bed. In conformity to this opinion, the chief means which he recommends for preventing the difeafe is a cool regimen and free circulation of air, which he evinces to be of the greateft importance. In refpect of bleeding, he informs us, that, upon the ftricteft inquiry, he cannot find that thofe who have bled the moft copioufly have had the greateft fuccefs, either in private or hofpital practice. He even feems to queftion the propriety of this evacuation in any cafe; but approves of emetics, cathartics, and clyfters, for cleanfing the *primæ viæ*, and likewife of fuch medicines and diet as will correct the putrid humours: adding, that an upright pofture and free ventilation are at all times ufeful, and abfolutely neceffary, both for the prevention and cure of the difeafe.

Another writer who treats of the child-bed fever is Dr Leake, who has publifhed the refult of his obfervations on this difeafe from April 1768 to the autumn of the year 1770; but chiefly from December 1769 to May 1770, during which period the child-bed fever prevailed much about London.

Dr Leake tells us that this fever generally commenced the evening of the fecond or morning of the third day after delivery, with a rigor or fhivering fit. Sometimes it invaded foon after delivery; and at other times, though rarely, it has feized fo late as the fifth or fixth day. Now and then it feemed to be occafioned by catching cold, or by errors in diet; but oftener by anxiety of mind. Sometimes the thirft was great; tho' the tongue had, in general, a better appearance at the beginning than is common in other fevers. It was feldom ever black or very foul; but, as the difeafe advanced, became white and dry, with an increafe of thirft; and at laft was of a brownifh colour towards the root, where it was flightly covered with an infpiffated mucus. The lofs of ftrength was fo great and fudden, that few of the patients could turn in bed without affiftance, even fo early as the firft or fecond day after the attack. The lochia, from firft to laft, were not obftructed, nor deficient in quantity; neither did the quality of this difcharge feem to be in the leaft altered from its natural ftate; a prefumption, fays the author, that the uterus was not at all affected. Of this he was convinced by making a confiderable preffure above the pubes with the hand, which did not occafion pain; but when the fame degree of preffure was applied higher, between the ftomach and umbilical region, it became almoft intolerable. A perfect crifis feldom if ever happened in this fever, which he imputes to the great oppreffion of the vital powers, whereby they were rendered unable to produce fuch an event. When the difeafe proved mortal, the patient generally died on the 10th or 11th day from the firft attack. In thofe who died of the fever, the omentum was found fuppurated; an inflammation of which part, or of the inteftines, Dr Leake concludes to be the proximate caufe of the difeafe.

In confequence of this idea of the caufe of the difeafe, Dr Leake affirms that venefection is the only remedy which can give the patient a chance for life. But, though it be the principal refource to be depended upon at the beginning of the fever, he obferves that it will feldom prove of fervice after the fecond or third day; and, if directed yet later, will only weaken and exhauft the patient; when, matter having begun to form in the omentum, the progrefs of the difeafe can no longer be prevented by that evacuation. At this period the blood begins to be tainted by the abforption of the purulent fluid; and the fever, from being inflammatory, is changed into a putrid nature.

After bleeding in fuch a quantity as the fymptoms require, he advifes that the corrupted bile be evacuated and corrected as foon as poffible; that the diar-

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rhœa, when exceſſive, be reſtrained by emollient anodyne clyſters and gentle ſudorifics, or even by opiates and mild aſtringents, when the patient's ſtrength begins to ſink under the diſcharge; and, laſtly, that where the ſigns of the putrefaction or intermiſſion take place, antiſeptics and the Peruvian bark may be adminiſtered.

The great uniformity of the ſymptoms in all Dr Leake's patients might authoriſe an opinion, that the fever which he deſcribes was in a great meaſure a diſeaſe *ſui generis*, and depended much upon the conſtitution of the air preceding and during the period in which the fever prevailed.

Dr Kirkland has alſo made judicious obſervations on this ſubject. He rejects the opinion that the puerperal fever is a diſeaſe *ſui generis*, and ariſes always from the ſame cauſe. The particular ſituation of child-bed women, he acknowledges, occaſions a ſimilarity in the appearance of all the febrile ſymptoms: but he affirms that the ſame kind of fever may be produced by various cauſes; for inſtance, by an inflammation of the uterus or abdomen, by putrid blood or other matter, and putrid miaſms. The ſymptoms, he obſerves, will vary according to the time of ſeizure. If the fever happens in three or four days after delivery, all the ſymptoms uſual to the ſituation of the patient will make their appearance; but if it do not invade till the milk has been ſecreted, and the lochial diſcharge be nearly finiſhed, the ſymptoms, if the breaſts are properly drawn, will, for the moſt part, be thoſe only which are common to that kind of diſorder by which the fever has been produced.

With reſpect to the cure of puerperal fevers, Dr Kirkland adviſes the antiphlogiſtic method when they ariſe from inflammation; but when this method fails of ſucceſs, and a diarrhœa ſupervenes, the diſeaſe has changed its nature, having become more or leſs putrid, and requires a very different treatment.

His obſervations relative to the management of the diarrhœa merit attention. No one, ſays he, would purge and bleed to cure the colliquative fever ariſing from the abſorption of matter in large wounds; and yet the only difference is, that in the puerperal fever the matter abſorbed from the uterus, &c. acts with more violence, becauſe the blood is commonly thinner and the habit in a more irritable ſtate. We ſee, continues he, that abſorbed matter purges as effectually as if any purging medicine had been given by the mouth; and may we not therefore do harm by additional purging, when there has been a large evacuation, eſpecially as purges in this caſe are incapable of entirely removing the *fomes morbi?*

He conſiders the Peruvian bark as the principal remedy, as ſoon as the pulſe ſinks, the heat is leſſened, and the ſtomach will bear it. If the bark increaſe the diarrhœa beyond moderation, he joins with it ſmall doſes of laudanum; but if the diarrhœa ſhould entirely ſtop without the fever going off, in place of laudanum he adviſes a proper quantity of rhubarb. Should the diarrhœa, notwithſtanding the uſe of the medicines propoſed, become ſo violent as to endanger the patient, he joins Mr White in recommending the columbo root, which is a warm cordial, and removes the irritability of the ſtomach and inteſtines more powerfully than any other bitter he knows.

Of this diſeaſe alſo, as it appeared in Derbyſhire and ſome of the adjacent provinces, an account has been publiſhed by Dr Butter. Concerning the cauſes and nature of the diſeaſe, he obſerves, that pregnancy ſeems to add much to the natural ſenſibility of the female conſtitution; becauſe at this period women are often ſubject to a train of nervous ſymptoms, which never moleſt them at other times. During geſtation likewiſe, the appetite is for the moſt part keen, while the digeſtion appears to be impaired; and this weakneſs is increaſed not only by improper food, of which the woman is frequently deſirous, but alſo by the inactivity attending her ſituation. To theſe circumſtances, it is added, that the inteſtinal paſſage being interrupted by the uterine preſſure, coſtiveneſs generally prevails. From the ſeveral obſervations here enumerated, Dr Butter concludes, that the proximate cauſe of the puerperal fever is a ſpaſmodic affection of the firſt paſſages, with a morbid accumulation in their cavity; and upon this ſuppoſition he endeavours to account for the various ſymptoms of the diſeaſe.

In treating of the method of cure, he lays down two indications; the former of which is to promote two, three, or four ſtools daily, in a manner ſuited to the ſtrength of the patient, till ſuch time as they reſume a natural appearance. The ſecond indication is to relieve all uneaſy ſymptoms, ſuch as heat, thirſt, head-ach, &c.

With reſpect to the opinion entertained by Dr Butter of the cauſe of the puerperal fever, it nearly coincides with that of Mr White. But however plauſible it may appear, we are not entirely ſatisfied that a diſeaſe attended with ſo peculiar ſymptoms as the puerperal fever can depend principally upon an irritability, which is not reſtricted either to the pregnant or puerperal ſtate.

The late Dr Thomas Young profeſſor of midwifery in the univerſity of Edinburgh, although he publiſhed nothing on the ſubject of the puerperal fever, wrote a very ingenious diſſertation reſpecting it, which was read in the Philoſophical Society of Edinburgh. In that diſſertation, after giving a very accurate account of the ſymptoms of the diſeaſe, which coincides very nearly with the account given by others, he endeavours to ſhow, that the *puerperal fever*, ſtrictly ſo called; is in every inſtance the conſequence of contagion; but he contends, that the contagious matter of this diſeaſe is capable only of producing its effect, in conſequence of a peculiar prediſpoſition given by delivery and its conſequences. In ſupport of this doctrine, he remarks, that for many years the diſeaſe was altogether unknown in the lying-in ward of the Royal Infirmary at Edinburgh; but that after it was once accidentally introduced into the hoſpital, almoſt every woman was in a ſhort time after delivery attacked with it; although prior to her delivery, ſhe may have lain even for weeks together, not only in the ſame ward with the infected, but even in the very next bed. He remarks, that it was only eradicated from the hoſpital in conſequence of the wards being entirely emptied, thoroughly ventilated, and new painted. After theſe proceſſes, puerperal females in the hoſpital remained as free from this diſeaſe as formerly. The puerperal fever, according to Dr Young, has very generally a ſtrong tendency to the typhoid type; although he allows, that

in

Puerperal Fever.

in the beginning it is not unfrequently attended with inflammatory symptoms, and even with topical inflammation, particularly in the intestinal canal. On this idea, he considers the puerperal fever as admitting of the same variety of treatment with other affections depending on contagion, in which sometimes an inflammatory, sometimes a putrescent tendency, prevails; such, for example, as small-pox or erysipelas. But from the prevailing putrescent tendency in this affection, he considers the free access of cool air, with the liberal use of antiseptics, as being very generally requisite.

It deserves to be remarked, that though the several writers who treat of this subject have conducted their method of cure conformably to their particular idea of the cause of the disease, respecting which their sentiments are very different, they seem to have been equally successful in the treatment of their patients. Indeed the several writers differ less from each other in their method of cure than might be expected, where so great an opposition of theoretical sentiments prevails. For after endeavouring to establish indications correspondent to their particular systems, those who contend for the expediency of promoting the intestinal discharge, dissuade not from a recourse to phlebotomy when the disease is attended with inflammatory symptoms; while, on the other hand, the most strenuous advocates for bleeding admit the utility of the former evacuation. It appears, therefore, that a due regulation of the alvine discharge is necessary through the whole course of the fever, but venesection only sometimes.

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CEPHALALGIA.
Head-Ach.

The head-ach is symptomatic of very many distempers, but is rarely an original disease itself. Dr Home acquaints us that his report-books only furnish four instances of it; and of these four, three were women. The disease proved fatal to the man; and after death, a considerable effusion of blood was found on the brain, together with some hydatids, and water in the ventricles.

Head-achs appear frequently to be occasioned by effusions of blood or serum; as well as by ulcers, and abscesses of the brain, dura and pia mater. Accretions and ossifications of different parts of the dura mater, falx, and brain, are also frequently discovered. An ossification of the falx, however, does not always produce head-ach: for Dr Home mentions a patient who had the falx ossified without head-ach; but he had been observed to be very furious when drunk. Congestions of blood in the vessels of the brain are also discovered from dissections to be a frequent cause of the head-ach; and nervous irritation alone will frequently produce it, as we see in the *clavus hystericus*.

In the cure of this disease we have little or no power over ossifications, effusions, or ulcerations; and hence the head-ach is frequently incurable. In congestions, and nervous affections, medicines may indeed be of some service. Congestion may be relieved by an evacuation of blood, either general or topical; as venesection, cupping, or leeches: by errhines; which, however, Dr Home thinks are little to be depended upon: by topical evacuations near the head by blisters, issues,

Cephalalgia.

or setons; by purgatives; or by determining the fluids to other parts, by rubefacients applied to the temples, pediluvia, &c.

Nervous irritation may be diminished, 1. By a great quantity of cold water drunk every morning. This is recommended by Hoffman; and will wash off all acrid particles from the stomach, while the cold strengthens and diminishes the sensibility of the part. This remedy was tried for a considerable time in one of Dr Home's patients without any effect. 2. Nervous and tonic medicines; as the bark, valerian, &c. These were tried in two of Dr Home's patients, but also without success. In a third the valerian succeeded. 3. By cold water applied to the head, immersion, or the shower-bath. 4. Cephalics; as lavender, rosemary, &c. In slight cases, the smell of eau de luce, or any strong volatile alkali, will generally prove a cure.

A *Dangerous* Affection *of the* ŒSOPHAGUS. 406

This distemper has only been treated of by Dr Munckley, who reckons it one of the most deplorable diseases of the human body. Its beginning is in general so slight as to be scarce worth notice, the patients perceiving only a small impediment to the swallowing of solid food: they usually continue in this state for many months; during which, all liquid foods, and even solids themselves, when cut small and swallowed leisurely, are got down without much difficulty: by degrees the evil increases, and the passage through the œsophagus becomes so narrow, that not the smallest solid whatever can pass through it; but, after having been detained for some time at the part where the obstacle is formed, is returned again with a hollow noise of a very peculiar kind, and with the appearance of convulsion.

The seat of this malady is sometimes near the top of the œsophagus, and at other times farther down, nearer the superior orifice of the stomach. In this last case, the part of the alimentary tube which is above the obstruction is frequently so dilated by the food which is detained in it as to be capable of containing a large quantity; and the kind of vomiting, by which it is again returned through the mouth, comes on sooner or later after the attempt to swallow, in proportion to the nearness or remoteness of the part affected. In the last stage of this disease, not even liquids themselves can be swallowed so as to pass into the stomach, and the patient dies literally starved to death.

On the dissection of such as have died in this manner, the œsophagus is found to be considerably thickened; and in some so contracted within at the diseased part, as scarcely to admit the passing of a common probe; in others, to adhere together in such a manner as entirely to close up the passage, and not to be separated without great difficulty.

He comes next to show what he has found to be the most efficacious method of treating this disease, which, though not uncommon, yet in general has been considered as incurable.

He claims not the merit of having discovered the method of cure, but hopes that some service may arise from publishing what his experience has confirmed to him; having first received the hint from another eminent physician.

Cephalalgia.

The only medicine, then, from the ufe of which he has ever found any fervice, is mercury; and in cafes which are recent, and where the fymptoms have not rifen to any great height, fmall dofes of mercury given every night, and prevented, by purgative medicines, from affecting the mouth, have accomplifhed the cure.

But where the complaint has been of long ftanding, and the fymptom has come on of the food's being returned through the mouth, a more powerful method of treatment becomes neceffary. In this cafe he has never found any thing of the leaft avail in removing any of the fymptoms, but mercury, ufed in a fuch a manner as to raife a gentle but conftant fpitting: and this method he has purfued with the happieft fuccefs. If this method be commenced before the complaint has gained too much ground upon the conftitution, the cafe is not to be defpaired of; and of thofe who have come under his care in this ftate, by much the greater part have received confiderable benefit from it, and many have been entirely cured.

The complaint itfelf, he obferves, is not very uncommon; but there is no inftance, to his knowledge, recorded, of fuccefs from any other manner of treating it, than that he has recommended.

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WORMS.

Thofe infefting the human body are chiefly of three kinds: the *afcarides*, or fmall round and fhort white worms; the *teres*, or round and long worm; and the *tænia*, or tape-worm.

The *afcarides* have ufually their feat in the rectum.—The *teretes* or *lumbrici* are about a fpan long, round and fmooth: they are feated for the moft part in the upper fmall inteftines; but fometimes they are lodged alfo in the ftomach, and in any part of the inteftines, even to the rectum.—The tape-worms are from two to forty feet long, according to the teftimony of Platerus; they generally poffefs the whole tract of the inteftines, but efpecially the ileum: they very much refemble a tape in their appearance, whence the name of *tape-worm*: but another fpecies of this genus, from the refemblance of each joint to a gourd feed, has the name of the *gourd-worm*.

In the Medical Tranfactions, Vol. I. Dr Heberden gives a very accurate account of the fymptoms produced by the *afcarides*, from an eminent phyfician who was troubled with them all his life. They brought on an uneafinefs in the rectum, and an almoft intolerable itching in the anus; which fenfations moft ufually came on in the evening, and prevented fleep for feveral hours. They were attended with heat, fometimes fo confiderable as to produce a fwelling in the rectum both internally and externally; and if thefe fymptoms were not foon relieved, a tenefmus was brought on, with a mucous dejection. Sometimes there was a griping pain in the lower part of the abdomen, a little above the *os pubis*. If this pain was very fevere, a bloody mucus followed, in which there were often found afcarides alive. They were alfo fometimes fufpected of occafioning difturbed fleep, and fome degree of head-ach.

On this cafe Dr Heberden obferves, that the general health of the patient did not feem to have fuffered from the long continuance of the difeafe, nor the immediate inconveniences of the diforder itfelf to have increafed. "It is (fays he) perhaps univerfally true, that this kind of worms, though as difficult to be cured as any, yet is the leaft dangerous of all. They have been known to accompany a perfon through the whole of a long life, without any reafon to fufpect that they had haftened its end. As in this cafe there was no remarkable ficknefs, indigeftion, giddinefs, pain of the ftomach, nor itching of the nofe, poffibly thefe fymptoms, where they have happened to be joined with the afcarides, did not properly belong to them, but arofe from fome other caufes. There is indeed no one fign of thefe worms, but what in fome patients will be wanting."

Worms.

The abovementioned patient ufed purging and irritating clyfters with very little fuccefs. One drachm and an half of tobacco was infufed in fix ounces of boiling water; and the ftrained liquor being given as a clyfter, occafioned a violent pain in the lower part of the abdomen, with faintnefs and a cold fweat: this injection, though retained only one minute, acted as a fmart purge, but did little or no good. Lime-water was alfo ufed as a clyfter; which brought on a coftivenefs, but had no good effect. Six grains of falt of fteel were diffolved in fix ounces of water, and injected. This clyfter in a few minutes occafioned an aching in the rectum, griped a little without purging, and excited a tenefmus. Some few afcarides were brought off with it; but all of them were alive. The uneafy fenfation in the rectum did not abate till fome warm milk was thrown up. Whenever the tenefmus or mucus ftools were thought worth the taking notice of, warm milk and oil generally gave immediate relief. If purging was neceffary, the lenient purges, fuch as manna with oil, were, in this particular cafe, made ufe of: rhubarb was found too ftimulating.—But, in general, the moft ufeful purge, and which therefore was moft ufually taken, was cinnabar and rhubarb, of each half a drachm: this powder feldom failed to bring away a mucus as tranfparent as the white of an egg, and in this many afcarides were moving about. The cinnabar frequently adhered to this mucus, which did not come off in large quantities, when a purge was taken without cinnabar. Calomel did no more than any other purge which operates brifkly would have done; that is, it brought away afcarides, with a great deal of mucus. Oil given as a clyfter fometimes brought off thefe animalcules: the oil fwam on the furface of the mucus, and the afcarides were alive and moving in the mucus itfelf, which probably hindered the oil from coming in contact with them and killing them.

The Doctor alfo obferves, that mucus or flime is the proper neft of the afcarides, in which they live, and is perhaps the food by which they are nourifhed; and it is this mucus which preferves them unhurt, though furrounded with many other liquors, the immediate touch of which would be fatal. It is hard to fatisfy ourfelves by what inftinct they find it out in the human body, and by what means they get at it; but it is obfervable in many other parts of nature, as well as here, that where there is a fit foil for the hatching and growth of animals and vegetables, nature has taken fufficient care that their feeds fhould find the way thither. Worms are faid to have been found in the inteftines of infants born dead. Purges, by

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by lessening this slime, never fail to relieve the patient: and it is not unlikely, that the worms which are not forced away by this quickened motion of the intestines, may, for want of a proper quantity of it, languish, and at last die; for if the ascarides are taken out of their mucus, and exposed to the open air, they become motionless, and apparently die in a very short time. Dr Heberden supposes that the kind of purge made use of is of some consequence in the cure of all other worms as well as ascarides; the animals being always defended by the mucus from the immediate action of medicines; and that therefore those purges are the best which act briskly, and of which a repetition can be most easily borne. Purging waters are of this sort, and jalap especially for children; two or more grains of which, mixed with sugar, are most easily taken, and may be repeated daily.

From the case above-mentioned, and from Dr Heberden's observations, we may easily see why it is so difficult to destroy these animals; and why anthelmintics, greatly celebrated for some cures, are yet so far from being specifics in the disease. As the worms which reside in the cavities of the human body are never exposed to the air, by which all living creatures are invigorated, it is evident, that in themselves they must be the most tender and easily destructible creatures imaginable, and much less will be requisite to kill them than any of our common insects. The most pernicious substances to any of the common insects are oil, caustic fixed alkali, lime, and lime-water. The oil operates upon them by shutting up the pores of their bodies; the lime-water, lime, and caustic alkali, by dissolving their very substance. In the case of intestinal worms, however, the oil can have very little effect upon them, as they are defended from it by the moisture and mucus of the intestines; the like happens with lime-water: and therefore it is necessary that the medicine should be of such a nature as to destroy both mucus and insects together; for which purpose the caustic fixed alkali is at once safe and efficacious; nor is it probable that any case of worms whatever could resist the proper use of this medicine. A very large dose of any salt indeed will also destroy the mucus and destroy the worms; but it is apt to inflame and excoriate the stomach and intestines, and thus to produce worse distempers than that which it was intended to cure. Dr Heberden gives the following remarkable case of a patient cured of worms by enormous doses of common salt, after trying many other remedies in vain. In February 1757, the patient was seized with uncommon pains in his stomach, attended with nausea, vomiting, and constipation of bowels, and an almost total loss of sleep and appetite: He soon became much emaciated, and could neither stand nor walk upright; his belly grew small and hard, and closely retracted, insomuch that the sternum covered the navel, and the latter could scarce be discovered or felt by the finger: his urine was always milky, and soon deposited a thick white sediment; his excrements were very hard and lumpy, resembling those of sheep, only of a brown colour; nor had he ever a stool without some medicine or other to procure it. In this situation he continued four years; during which time he had been in an infirmary, attended by eminent physicians, but was dismissed as incurable. At last he was advised by a neighbour to drink salt and water, as he said he knew one cured by it who had for many years been afflicted with the same kind of pains in the belly and stomach. As his distemper was now almost insupportable, he willingly tried the experiment. Two pounds of common salt were dissolved in as little water as possible, all which he drank in less than an hour. Soon afterwards he found himself greatly oppressed at the stomach, grew extremely sick, and vomited violently; on the fourth straining he brought up about half a pint of small worms, part ascarides, and the rest resembling those worms which are called the *botts*, and frequently met with in the stomach of horses, but much smaller, and about the size of a grain of wheat. The salt soon began to operate downwards, and he had five or six very copious fetid stools, tinged with blood; and in them discharged near an equal quantity of the same kind of worms he had vomited. Being greatly fatigued with the violence of the operations, he fell into a calm sleep, which lasted two hours, during which he sweated profusely, and awoke much refreshed. Instead of his usual pains, he now only complained of a rawness and soreness of his gullet, stomach, and bowels, with an almost unquenchable thirst; to allay which, he drank large quantities of cold water, whey, butter-milk, or whatever he could get. The urine he now passed was small in quantity, and rendered with very great difficulty, being highly saturated with the salt, from whence arose a most troublesome dysuria and strangury. However, these symptoms gradually abated by a free use of the liquors above-mentioned; and on the third morning he was so well recovered, that he took two pounds more of salt, dissolved in the like quantity of water. The effects were nearly similar to the former; only that most of the worms were now burst, and came away with a considerable quantity of slime and mucus. The drought, strangury, &c. returned with their former violence, but soon yielded to the old treatment. He sweated very copiously for three days, slept easily, and by that time could extend his body freely: on the fifth day he left his bed, and, though very weak, could walk upright; his strength and appetite soon returned, and he became robust and well.

The anthelmintic medicines which have been recommended by one person or other, are in a manner innumerable; but the principal are,

1. *Quicksilver.* This is very efficacious against all kinds of worms, either taken in the form of calomel or corrosive sublimate. Even the crude metal boiled in water and the water drunk, has been recommended as an almost certain cure. But this, it is evident, can receive no impregnation from the mercury. If, therefore, it have any effect, it must be from some foreign and accidental impregnation. In most instances there can be no objection to mercury, but only that it is not endowed with any attenuating quality whereby the mucus in which these insects resides can be dissolved. It therefore fails in many cases, though it will most certainly destroy worms where it can get at them.

2. *Powder of tin.* This was for some time celebrated as a specific, and indeed we may reasonably expect good effects from it; as by its weight and

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grittiness it rubs off the mucus and worms it contains from the coats of the intestinal canal, in which case they are easily evacuated by purgatives. In order to produce any considerable effects, it must be given in a large dose.

3. *Geoffræa inermis, or cabbage bark* This remedy is used by the inhabitants of Jamaica. The first account of it which appeared in this country was published in the Physical and Literary Essays, vol ii. by Mr Duguid surgeon in that island. He acquaints us, that the inhabitants of Jamaica, young and old, white and black, are much infested with worms, especially the long round sort; the reason of which, he thinks, is the quantity of sweet viscid vegetables which they eat. On dissecting a child of seven months old, who died of vomiting and convulsions, twelve large worms were found; one of them filled the *appendix vermiformis*, and three of them were entwisted in such a manner as to block up the *valvula Tulpii*, so that nothing could pass from the small to the great guts.—The cabbage-bark, however, he tells us, is a safe and effectual remedy, and the most powerful vermifuge yet known; and that it frequently brings away as many worms by stool as would fill a large hat. He owns that it has sometimes violent effects; but this he ascribes to the negroes who make the decoction (in which form the bark is used), and not to the remedy itself.

Mr Anderson, surgeon in Edinburgh, has also given an account of this bark and its operation, in a letter to Dr Duncan, published in the Edinburgh Medical Commentaries, volume iv. p. 84. From this account it appears, that there are two different kinds of bark; the one much paler than the other: the pale kind operates much more violently than the other. It often occasions loose stools, great nausea, and such like symptoms, attended with great uneasiness in the belly: in one or two instances it was suspected of inducing syncope. The darker coloured kind resembles the cassia lignea, though it is of a much coarser texture. This kind, Mr Anderson thinks, may be exhibited in any case where an anthelmintic is necessary; the dangerous symptoms might have followed either from the use of the first kind, or from an over-dose of the second. The usual method of preparing the medicine is by boiling two ounces and a half of the bark in two quarts of water to a pint and a half. Of this a tea-spoonful may be given at first in the morning, gradually increasing the quantity till we come to four or five table-spoonfuls in a day. When exhibited in this manner, Mr Anderson informs us, that he never saw it produce any violent symptoms, and has experienced the best effects from it as an anthelmintic. After the use of this decoction for eight or nine mornings successively, a dose of jalap with calomel must be given, which seldom fails to bring away the worms, some dead, some alive. If at any time the decoction produce more than one or two loose stools, a few drops of liquid laudanum may be given; and, in general, Mr Anderson gave 15 or 20 drops of the spirit of lavender with each dose.

In a letter from Dr Rush, professor of chemistry at Philadelphia, to Dr Duncan of Edinburgh, the following account is given of another preparation of this medicine. "It has long (says he) been a complaint among physicians, that we have no *vermifuge* medicine which can be depended upon. Even calomel fails in many cases where there are the most pathognomonic signs of worms in the bowels. But this complaint, it is hoped, is now at an end. The physicians of Jamaica have lately found, that the *cabbage-bark*, as it is called in the West Indies, made into a syrup with brown sugar, is an infallible antidote to them. I have used above 30 pounds of it, and have never found it fail in one instance The syrup is pleasant; it sometimes pukes, and always purges, the first or second time it is given."

Notwithstanding these encomiums, however, the cabbage-bark (A) hath not come into general use in Britain. But diseases from the *teretes*, or *lumbrici* as they are often called, the species of worm against which this bark is employed, much less frequently occur than in some other countries. When they do occur, in almost every instance they readily yield to more gentle and safe anthelmintics; and the worms may not only be expelled by calomel, but by the vegetable bitters; as the powder of the semen santonicum, or the like.

4. *Cowhage*, or *cow-itch*. This is the *Dolichos urens* or *pruriens* of Linnæus; and the principles on which it acts have been already explained under the article DOLICHOS. It is somewhat similar to the powder of tin, but bids fair for being more efficacious. It might at first appear to occur as objections to this medicine, that by the hairs of it entangling themselves with one another, calculi might be formed in the intestines, or obstructions equally bad; or if the sharp points and hooks with which it abounds were to adhere to the nervous coats of the intestines themselves, they might occasion a fatal irritation, which could not be removed by any means whatever. But from the experience of those who have employed it extensively in practice, it would appear, that these objections are entirely theoretical; and that it may be employed with perfect safety. The spiculæ, gently scraped off from a single pod, and mixed with syrup or melasses, are taken for a dose in the morning fasting. It is repeated in this manner for two or three days without any sensible operation; but even a very slight purgative taken afterwards has been found to discharge an almost incredible quantity of worms. And according to Dr Bancroft, who has given a very particular account of its use in his Natural History of Guaiana, it is one of the safest and most certain anthelmintics yet discovered; but, as well as the bark of the *Geoffræa*, it has hitherto been very little used in Britain, probably from its not being necessary.

5. *Indian pink*. This plant, which in the *Spigelia marilandica*

(A) The most accurate account of this vegetable, and its effects, has been given by Dr Wright in the Philosophical Transactions, of which the reader will find a short view under the article *Geoffræa*, in the order of the alphabet.

Worms. *marilandica* of Linnæus, is alfo an American plant, and was firft recommended in the Edinburgh Phyfical and Literary Effays by Dr Garden of Charleftown in South Carolina. He is of opinion that a vomit ought always to precede the ufe of it; and informs us, that half a drachm of it purges as brifkly as the fame quantity of rhubarb. At other times he has known it produce no effect on the belly though given in very large quantity: In fuch cafes it becomes neceffary to add a grain or two of fweet mercury, or fome grains of rhubarb; but then it is lefs efficacious than when it proves purgative without addition. The ufe of it, however, in fmall dofes, is by no means fafe; as it frequently produces giddinefs, dimnefs of fight, convulfions, &c. The addition of a purgative, indeed, prevents thefe effects; but at the fame time, as already obferved, it diminifhes the virtue of the medicine. The Doctor therefore recommends large dofes, as from them he never knew any other effect than the medicine's proving emetic or violently cathartic. The dofe is from 12 to 60 or 70 grains of the root in fubftance, or two, three, or four drachms of the infufion, twice a-day.

This medicine has alfo had its day, and is now very far from being confidered as a fpecific. From what has been already obferved, it muft pretty clearly appear, that powder of tin, cow-itch, or fixed alkaline falts, bid faireft for deftroying worms in all the variety of cafes in which they can occur. Alkalies indeed have been but little tried. We have known one cafe in which all the complaints have been removed by a fingle dofe: we have alfo an inftance of their efficacy, in an extraordinary cafe of a worm bred in the liver, mentioned in the 2d volume of the Medical Obfervations. The patient had a violent pain in the fide, and fometimes in the fhoulder, as the worm fhifted its place; but, on the application of a lixivial poultice, the pain went out of the fide entirely, and kept in the fhoulder for fome weeks.

The long round worms feem to be the moft dangerous which infeft the human body, as they often pierce through the ftomach and inteftines, and thus bring on a miferable death. The common fymptoms of them are naufea, vomiting, loofenefs, fainting, flender intermitting pulfe, itching of the nofe, and epileptic fits. By the confumption of the chyle they produce hunger, palenefs, weaknefs, coftivenefs, tumor of the abdomen, eructations, and rumbling of the inteftines; but it is from the perforation of the inteftines that the difeafe proves fo frequently fatal. A child may be known to have worms from his cold temperament, palenefs of the countenance, livid eye-lids, hollow eyes, itching of the nofe, voracity, ftartings, and grinding of the teeth in fleep; and more efpecially by a very fetid breath. Very frequently, however, they are voided by the mouth and anus, in which cafe there is no room for doubt. In the Medical Commentaries, vol. II. we have an account of the inteftines being perforated by a worm, and yet the patient recovered. The patient was a woman troubled with an inflammation in the lower part of the abdomen. The pain was fo violent, that for fix days fhe flept none at all; the tumor then broke, difcharged upwards of a pound of thin watery fanies, immediately after which the excrements followed. The next day fhe was extremely low; her pulfe could fcarcely be felt; the extremities were cold; and there was a confiderable difcharge from the wound, which had already begun to mortify. She got a decoction of the bark with wine, which alleviated the fymptoms; but in removing the mortified parts a worm was found among them nine inches long, and as thick as an eagle's quill. By proper applications, the difcharge of excrements ceafed, and fhe recovered perfect health. She was fenfible of no accident giving rife to the inflammation; fo that in all probability it arofe entirely from the worm itfelf.

The *tænia*, or *tape-worm*, as it is called, is one of thofe moft difficult to be removed from the human body. It is of two kinds, *tænia folium* and *tænia lata*; for a defcription of which fee the article Tænia.—The reafon of its being fo difficult to cure, is, that though portions of it are apt to break off and be difcharged, it is endowed with a power of reproduction, fo that the patient is little or nothing better. The fymptoms occafioned by it are not different from thofe above defcribed. A fpecific againft the *tænia lata* hath been lately fo much celebrated in France, that the king thought proper to purchafe it from the proprietor (Madam Nouffer), and the account of it has been tranflated into Englifh by Dr Simmons. The patients are required to obferve no particular regimen till the day before they take the fpecific. That day they are to take nothing after dinner till about 7 o'clock; after which, they are to take the following foup: "Take a pint and an half of water, two or three ounces of good frefh-butter, and two ounces of bread cut into thin flices: add to this falt enough to feafon it, and then boil it to the confiftence of panada." About a quarter of an hour after this, they take a bifcuit and a glafs of white-wine, either pure or mixed with water; or even water alone, if they have not been accuftomed to wine. If the patient has not been to ftool that day, (which, however, is not ufual with patients in this way), the following clyfter is to be injected. "Take a fmall quantity of the leaves of mallows, and boil them in a fufficient quantity of water, mixing with it a little falt, and when ftrained off add two ounces of oil olive." Next morning, about eight or nine hours after the fupper above mentioned, the fpecific is to be taken. This is no other than two or three drachms of the root of male fern, *polypodium filix mas* of Linnæus, gathered in autumn, and reduced to fine powder. It is to be taken in any diftilled water, or in common water. This medicine is apt to occafion a naufea: to avoid which, Madam Nouffer allows her patients to chew any thing that is agreeable, but forbids any thing to be fwallowed; or they may fmell to vinegar, to check the ficknefs: but if, notwithftanding this, the fpecific be thrown up, a frefh dofe muft be fwallowed as foon as the ficknefs is gone off, and then they muft try to fleep. About two hours after this the following bolus is to be taken. "Take of the panacea of mercury 14 times fublimed, and felect refin of fcammony, each ten grains; of frefh and good gamboge, fix or feven grains: reduce each of thefe fubftances feparately into powder, and then mix them with fome conferve into a bolus." This compofition is to be fwallowed at two different times, wafhing it down with

Worms. with one or two dishes of weak green-tea, after which the patient must walk about his chamber. When the bolus begins to operate, he is to take a dish of the same tea occasionally, until the worm be expelled; then, and not before, Madame Nouffer gives him broth or soup, and he is directed to dine as is usual after taking physic. After dinner he may either lie down or walk out, taking care to conduct himself discreetly, to eat but little supper, and to avoid every thing that is not of easy digestion.

The cure then is complete; but it is not always effected with the same quickness in every subject. He who has not kept down the whole bolus, or who is not sufficiently purged by it, ought to take, four hours after it, from two to eight drachms of Epsom salt dissolved in boiling water. The dose of this salt may be varied according to the temperament and other circumstances of the patient.

If the worm should not come away in a bundle, but in the form of a thread (which particularly happens when the worm is involved in much tenacious mucus), the patient must continue to sit upon the close stool without attempting to draw it away, drinking at the same time warm weak tea: sometimes this alone is not sufficient, and the patient is obliged to take another dose of purging salt, but without varying his position till the worm be wholly expelled.

It is unusual for patients who have kept down both the specific and purging dose, not to discharge the worm before dinner-time. This, however, sometimes happens when the dead worm remains in large bundles in the intestines, so that the fæces becoming more limpid towards the end of the purging, pass by it without drawing it with them. The patient may in this case eat his dinner; and it has been observed, that the food, joined to the use of a clyster, has brought about the expulsion of the worm.

Sometimes the worm is brought away by the action of the specific alone, before the patient has taken the purging bolus: when this happens, Madame Nouffer gives only two-thirds of it, or substitutes the salt in its stead.

Patients must not be alarmed by any sensation of heat or uneasiness they may feel during the action of the remedy, either before or after a copious evacuation, or just as they are about to void the worm. These sensations are transitory, and go off of their own accord, or by the assistance of the vapour of vinegar drawn in at the nose.

They who have vomited both the specific and bolus, or who have kept down only a part of them, sometimes do not void the worm that day. Madame Nouffer therefore directs them to take again that night the soup, the wine and biscuit; and if circumstances require it, the clyster. If the worm do not come away during the night, she gives them early the next morning another dose of the specific, and, two hours afterwards, six drachms or an ounce of purging salt, repeating the whole process of the preceding day; excepting the bolus, which she suppresses.

She observes, that very hot weather diminishes in some degree the action of her remedy; she therefore prefers the month of September for administering it; but as she has not been always able to choose the season, and has been sometimes obliged to undertake the cure of patients in the hottest days of summer, she then gave her specific very early in the morning; and with this precaution she saw no difference in its effects.

On the day appointed for the trial of this medicine before the commissioners nominated by the king of France, it was exhibited to five different persons; but only one of them was certainly known to have the *tænia lata* by having discharged parts of it before. That person was cured; the second voided a portion of the *tænia solium*; the third some *ascarides*, with a part of the *tænia solium*; the fourth and fifth voided no worms; but the last considered much of the viscid slime he voided to be worms in a dissolved state.

This trial was thought sufficient to ascertain the efficacy of the medicine, and further trials were made by those to whom the secret was communicated. The first voided two tænia, after much vomiting and 18 or 20 stools; the second had no vomiting, but was as violently purged, and discharged two worms; the third had 20 copious stools during the night, and discharged the worm in the morning; and the fifth was effected in much the same manner. Some others who were not relieved, were supposed not to have a tænia.

This specific, however, is not to be considered as a new discovery; the efficacy of fern in cases of tenia having been known long ago. Theophrastus prescribes its root, in doses of four drams, given in water sweetened with honey, as useful in expelling flat worms.—Dioscorides orders it in the same dose, and adds, that its effects are more certain when it is mixed with four oboli (40 grains) of scammony or black hellebore; he particularly requires that garlic should be taken before hand. Pliny, Galen, Oribasius, and Aëtius, ascribe this same virtue to fern; and are followed in this by Avicenna, and the other Arabian physicians. Dorstenius, Valerius Cordus, Dodonæus, Mathiolus, Dalechampius, who commented on Dioscorides, or copied him in many things, all mention the fern-root as a specific against the tænia. Sennertus, and Burnet after him, recommended in similar cases an infusion of this plant, or a dram of its powder for young persons, and three drams for adults. Simon Paulus, quoted by Ray and Geoffroy, considers it as the most efficacious of all poisons against the flat worm, and as being the basis of all the secret remedies extolled by empirics in that disease. Andry (*génér. des Vers, p.* 246, 249) prefers distilled fern-water to the root in powder, or he employs it only in the form of an opiate, or mixed with other substances.

These are not the only authors who have mentioned the tænia; many others have described this worm, the symptoms it excites, and the treatment proper to expel it. Almost all of them mention the fern-root, but at the same time they point out other remedies as possessing equal efficacy. Amongst these we find the bark of the root of the mulberry-tree, the juice of the *auricula murus*, the roots of *chamæleon niger*, ginger, zedoary; decoctions of mugwort, southernwood, wormwood, penny-royal, origanum, hyssop, and in general of all bitter and aromatic plants, &c. Some of them direct the specific to be simply mixed and taken in wine or honey and water; others join to it the use of some purgative remedy, which they say adds to its efficacy. Oribasius, Sylvius, &c. distinguish the specific

cific that kills the worm, from the purgative that evacuates it, and direct them to be given at different times. Sennertus gives a very satisfactory reason for adopting this method. If we give, says he, the purgative medicine and the specific at the same time, the latter will be hastily carried off before it can have exerted its powers on the worm: whereas, if we give the specific first, and thus weaken the worm, it will collect itself into a bundle, and, being brought away by means of the purge, the patient will be cured. The cure will be more speedy if the *primæ viæ* have been previously lubricated. These precautions are all of them essential to the success of the remedy, nor are they neglected by Madame Nouffer in her method of treatment. The panada and injection she prescribes the night before, to lubricate the intestines, and prepare the *primæ viæ*. The fern-root, taken in the morning, kills and detaches the worm: of this the patients are sensible by the cessation of the pain in the stomach, and by the weight that is felt in the lower belly. The purgative bolus administered two hours after this, procures a complete evacuation; it is composed of substances that are at once purgative and vermifuge, and which, even when administered alone, by different physicians, sometimes succeeded in expelling the worm. If this purgative appear to be too strong, the reader is desired to recollect, that it produced no ill effects in either of the cases that came under the observation of the physicians appointed to make the trials; and that in one of those cases, by diminishing the dose, they evidently retarded the evacuations.—Regard however, they observe, is to be had both to the age and the temperament of the patient, and the treatment should always be directed by a prudent and experienced physician, who may know how to vary the proportions of the dose as circumstances may require. If the purgative be not of sufficient strength, the worm, after being detached by the specific, remains too long a time in the intestines, and becoming soon corrupted is brought away only in detached portions: on the other hand, if the purgative be too strong, it occasions too much irritation, and evacuations that cannot fail to be inconvenient.

Madame Nouffer's long experience has taught her to distinguish all these circumstances with singular adroitness.

This method of cure is, as we have seen, copied in a great measure from the ancients: it may be possible to produce the same effects by varying the remedies; but the manner of applying them is by no means indifferent: we shall be always more certain of success, if the intestines be previously evacuated, and if the specific be given some time before the purgative bolus. It is to this method that Madame Nouffer's constant success is attributed.

Her remedy has likewise some power over the *tænia solium*; but as the rings of this worm separate from each other more easily than those of the *tænia lata*, it is almost impossible for it to be expelled entire. It will be necessary therefore to repeat the treatment several times, till the patient cease to void any portions of worms. It must likewise be repeated, if, after the expulsion of one *tænia solium*, another should be generated in the intestinal canal. This last case is so rare, that it has been supposed that no person can have more than one of these worms; and for this reason it has been named *solitary worm*, which, being once removed, could never be renewed or replaced by a second: but experience has proved, that this notion is an ill-founded prejudice, and we know that sometimes these worms succeed each other, and that sometimes many of them exist together. Two living tæniæ have frequently been expelled from the same patient. Dr de Haen (*Rat. Med.* tom. viii. p. 157.) relates an instance of a woman who voided 18 tæniæ at once. In these cases the symptoms are usually more alarming; and the appetite becomes excessive, because these worms derive all their nourishment from the chyle. If too austere and ill judged a regimen deprives them of this, they may be expected to attack even the membranes of the intestines themselves. This evil is to be avoided by eating frequently.

Such are the precautions indicated in this disease. The ordinary vermifuge remedies commonly procured only a palliative cure, perhaps because they were too often improperly administered. But the efficacy of the present remedy, in the opinion of the French physicians, seem to be sufficiently confirmed by experience. To the above account, however, it seems proper to subjoin the following observations by Dr Simmons.

"A Swiss physician, of the name of *Herrenschwand*, more than 20 years ago, acquired no little celebrity by distributing a composition of which he styled himself the *inventor*, and which was probably of the same nature as Madame Nouffer's. Several very eminent men, as Tronchin, Hovius, Bonnet, Cramer, and others, have written concerning the effects of this remedy. It seems that Dr Herrenschwand used to give a powder by way of preparation, the night before he administered his specific. Nothing could be said with certainty concerning the composition either of one or the other. The treatment was said sometimes to produce most violent effects, and to leave the patients in a valetudinary state. Dr De Haen was dissuaded by his friends from using it, because it disordered the patients too much. It will be readily conceived, now that we are acquainted with Madame Nouffer's method, that these effects were occasioned wholly by the purgative bolus. It is not strange, that resin of scammony or jalap, combined with *mercurius dulcis* and gamboge, all of them in strong doses, should in many subjects occasion the greatest disorders. It seems likely, however, that much of the success of the remedy depends on the use of a drastic purge. Some of the ancients who were acquainted with the virtues of the fern-root, observed that its efficacy was increased by scammony. Resinous purges, especially when combined with mercury, have often been given with success in cases of *tænia*. Dr De Haen saw a worm of this sort five ells long expelled by the resin of jalap alone. Dr Gaubius knew a woman who had taken a variety of anthelmintic remedies without any effect, though she had voided a portion of *tænia* an ell and a half long previous to the use of these medicines: but at length, after taking a purge of singular strength, she voided the worm entire. Many other instances of the same kind are to be met with in authors. Other remedies have occasionally been given with success. In Sweden, it has been a practice to drink several gallons

Worms. gallons of cold water, and then to take some drastic purge. Boerhaave says, that he himself saw a *tænia* measuring 300 ells expelled from a Russian by means of the *vitriolum martis*. All these methods, however, have been too often ineffectual."

From some late accounts, there is reason to believe that Dr Herrenschwand's remedy for *tænia* does not so exactly agree with that of Madame Nouffer as Dr Simmons seems to imagine. According to the account given us by a gentleman who had his information from Dr Herrenschwand himself, it consists entirely of gamboge and fixed vegetable alkali.

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Of POISONS.

These have all been treated of already, except the bites and stings of serpents, scorpions, &c. According to Dr Mead, the symptoms which follow the bite of a viper are, an acute pain in the place wounded, with a swelling, at first red, but afterwards livid, which by degrees spreads farther to the neighbouring parts; with great faintness, and a quick, low, and sometimes interrupted pulse; great sickness at stomach, with bilious convulsive vomitings, cold sweats, and sometimes pains about the navel. Frequently a fanious liquor runs from the small wound, and little pustules are raised about it: the colour of the whole skin in less than an hour is changed yellow, as if the patient had the jaundice. These symptoms are very frequently followed by death, especially if the climate be hot, and the animal of a large size. This is not, however, the case with all kinds of serpents. Some, we are assured, kill by a fatal sleep; others are said to produce an universal hemorrhagy and dissolution of the blood; and others an unquenchable thirst. But of all the species of serpents hitherto known, there is none whose bite is more expeditiously fatal than that of the rattle-snake. Dr Mead tells us, that the bite of a large serpent of this kind killed a dog in a quarter of a minute; and to the human species they are almost equally fatal. Of this serpent it is said, that the bite makes the person's skin become spotted all over like the skin of the serpent; and that it has such a motion as if there were innumerable living serpents below it. But this is probably nothing more than a dissolution of the blood, by which the skin becomes spotted as in petechial fevers, at the same time that the muscles may be convulsed as in the distemper called *hieranosos*, which was formerly thought to be the effect of evil spirits: but it is even not improbable that observers have been somewhat aided by fancy and superstition when they thought that they detected such appearances.

It has justly appeared surprising to philosophers, how such an inconsiderable quantity of matter as the poison emitted by a viper at the time of biting should produce such violent effects. But all inquiries into this matter must necessarily be uncertain; neither can they contribute any thing towards the cure. It is certain that the poison produces a gangrenous disposition of the part itself, and likewise seemingly of the rest of the body; and that the original quantity of poison continues some time before it exerts all its power on the patient, as it is known that removing part of the poisonous matter by suction will alleviate the symptoms. The indications of cure then are three. 1. To remove the poisonous matter from the body: Or, 2. If this cannot be done, to change its destructive nature by some powerful and penetrating application to the wound: And, 3. To counteract the effects of that portion already received into the system. Poisons.

The poisonous matter can only be removed from the body by sucking the wound either by the mouth, or by means of a cupping-glass; but the former is probably the more efficacious, as the saliva will in some measure dilute and perhaps obtund the poison. Mead directs the person who sucks the wound to hold warm oil in his mouth, to prevent inflammation of the lips and tongue: but as bites of this kind are most likely to happen in the fields, and at a distance from houses, the want of oil ought by no means to retard the operation, as the delay of a few minutes might prove of the most fatal consequence; and it appears from Dr Mead's experiments, that the taking the poison of a viper into the mouth undiluted, is attended with no worse consequences than that of raising a slight inflammation. A quick excision of the part might also be of very great service.

The only way of answering the second indication is, by destroying the poisoned part by a red-hot iron, or the application of alkaline salts, which have the power of immediately altering the texture of all animal-substances to which they are applied, provided they are not covered by the skin; and as long as the poison is not totally absorbed into the system, these must certainly be of use.

To answer the third indication, Dr Mead recommends a vomit of ipecacuanha, encouraged in the working with oil and warm water. The good effects of this, he says, are owing to the shake which it gives to the nerves, whereby the irregular spasms into which their whole system might be drawn are prevented. After this the patient must go to bed, and a sweat must be procured by cordial medicines; by which the remaining effects of the poison will be carried off.

It has been confidently asserted by many, that the American Indians are possessed of some specific remedy by which they can easily cure the bite of a rattle-snake. But Mr Catesby, who must have had many opportunities of knowing this, positively denies that they have any such medicine. They make applications indeed, and sometimes the patient recovers; but these recoveries he ascribes to the strength of nature overcoming the poison, more than to the remedies made use of. He says, they are very acute in their prognostics whether a person that is bit will die or not; and when they happen to receive a bite in certain parts of the body, when the teeth of the animal enter a large vein, for instance, they quietly resign themselves to their fate, without attempting any thing for their own relief. Indeed, so violent and quick is the operation of this poison, that unless the antidote be instantly applied, the person will die before he can get to a house. It would seem therefore eligible for those who are in danger of such bites, to carry along with them some strong alkaline ley, or dry alkaline salt, or both, which could be instantly clapt on the wound, and by its dissolving power would destroy both the poison and the infected parts. Strong cordials also, such as ardent spirits, volatile alkali, &c. might possibly excite the languid powers of nature, and enable her to expel

Poison. expel the enemy, which would otherwise prove too powerful. This seems to be somewhat confirmed from the account we have in the Philosophical Transactions of a gentleman bit by a rattle-snake, who was more relieved by a poultice of vinegar and vine-ashes put to his wound than any thing else. The vine-ashes being of an alkaline nature, must have saturated the vinegar, so that no part of the cure could be attributed to it: on the other hand, the ashes themselves could not have been saturated by the small quantity of acid necessary to form them into a poultice; of consequence they must have operated by their alkaline quality.—Soap-ley, therefore, or very strong salt of tartar, may reasonably be thought to be the best external application, not only for the bites of vipers, but of every venomous creature; and in fact we find *dry salt* universally recommended both in the bites of serpents and of mad dogs. Dr Mead recommends the fat of vipers presently rubbed into the wound; but owns that it is not safe to trust to this remedy alone.

Some years ago the volatile alkali was strongly recommended by M. Sage of the French academy, as a powerful remedy against the bite of the viper: and, by a letter from a gentleman in Bengal to Dr Wright, it would appear that this article, under the form of the *eau de luce*, which is very little if any thing different from the *spiritus ammoniæ succinatus* of the London Pharmacopoeia, has been employed with very great success against this affection in the East Indies: but from the trials made with it by the Abbé Fontana, published in his Treatise on the Poison of the Viper, it would appear that it by no means answered his expectation; and the efficacy of this, as well as of the snake pills mentioned under the article HYDROPHOBIA, still requires to be confirmed by further experience.

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MELÆNE.

THIS is a distemper not very common, but it has been observed by the ancient physicians, and is described by Hippocrates under the name of *morbus niger*. It shows itself by a vomiting and purging of black tar-like matter; which Hippocrates, Boerhaave, and Van Swieten, supposed to be occasioned by atra bilis. But Dr Home, in his Clinical Experiments, shows that it is owing to an effusion of blood from the meseraic vessels, which by its stagnation and corruption assumes that strange appearance. The disease, he says, frequently follows hæmorrhagy; and those of a scorbutic habit are most subject to it. It is an acute disease, and terminates soon; yet is not attended with any great degree of fever. In one of Dr Home's patients the crisis happened on the eighth day by diarrhœa; in another, on the 14th, by sweat and urine; and a third had no evident critical evacuation.

As to the cure, Dr Home observes, that bleeding is always necessary where the pulse can bear it; nor are we to be deterred from it by a little weakness of the pulse, more than in the enteritis. Emetics are hurtful, but purgatives are useful. But the most powerful medicine for checking this hæmorrhagy is the vitriolic acid: and, that this might be given in greater quantity, he mixed it with mucilage of gum arabic; by which means he was enabled to give double the quantity he could otherwise have done. The cold bath was tried in one instance, but he could not determine whether it was of any service or not. The cure was completed by exercise and the bark. Diseases of Children.

Of the DISEASES of CHILDREN. 410

Dr Buchan observes, that from the annual registers of the dead it appears, that about one half of the children born in Great Britain die under twelve years of age; and this very great mortality he attributes in a great measure to wrong management. The particulars of this wrong management enumerated by him are,

1. Mothers not suckling their own children. This, he owns, it is sometimes impossible for them to do; but where it can be done, he affirms that it ought never to be omitted. This, he says, would prevent the unnatural custom of mothers leaving their own children to suckle those of others; on which he passes a most severe censure, and indeed scarce any censure can be severe enough upon such inhumanity. Dr Buchan informs us, "He is sure he speaks within bounds, when he says not one in a hundred of these children live who are thus abandoned by their mothers." For this reason he adds, that no mother should be allowed to suckle another's child till her own be fit to be weaned. A regulation of this kind would save many lives among the poorer sort, and would do no harm to the rich; as most women who make good nurses are able to suckle two children in succession upon the same milk.

2. Another source of the diseases of children is the unhealthiness of parents: and our author insists that no person who labours under an incurable malady ought to marry.

3. The manner of clothing children tends to produce diseases. All that is necessary here, he says, is to wrap the child in a soft loose covering; and the softness of every part of the infant's body sufficiently shows the injury which must necessarily ensue by pursuing a contrary method.

4. A new-born infant, instead of being treated with syrups, oils, &c. ought to be allowed to suck the mother's milk almost as soon as it comes into the world. He condemns the practice of giving wines and spirituous liquors along with the food soon after birth; and says, that if the mother or nurse has a sufficient quantity of milk, the child will need little or no other food before the third or fourth month. But to this it may reasonably be objected, not only that the nursing would thus be very severe on the mother; but if the child be left thus long without food, it will not easily relish it for some time, and its stomach is apt to be easily hurt by a slight change of diet after it has been long accustomed to one thing. Neither can it be shown, that the strongest and most healthy infants are those which get no other food but the mother's milk during the first months of their life. In fact, children are evidently of a weak and lax habit of body, so that many of their diseases must arise from that cause; all directions which indiscriminately advise an antiphlogistic regimen for infants as soon as they come into the world, must of necessity be wrong. Many instances in fact might be brought to show, that by the preposterous method of starving infants, and at the same time treating them with vomits and purges, they are

Diseases of Children.

often hurried out of the world. Animal-food indeed is exceessively agreeable to children, and they ought to be indulged with it in moderation; and this will prove a much better remedy for those acidities with which children are often troubled, than magnesia alba, crab's eyes, or other absorbents, which have the most pernicious effects on the stomachs of these tender creatures, and pall the appetite to a surprising degree The natural appetites of children are indeed the best rule by which we can judge of what is proper or improper for them. They must no doubt be regulated as to the quantity; but we may be assured that what a child is very fond of will not hurt it if taken in moderation. When children are sick, they refuse every thing but the breast; and if their distemper be very severe, they will refuse it also; and in this case they ought not to be pressed to take food of any kind: but when the sickness goes off, their appetite also returns, and they will require the usual quantity of food.

According to Dr Armstrong, *inward fits*, as they are called, are in general the first complaint that appears in children; and as far as he has observed, most, if not all infants, during the first months, are more or less liable to them. The symptoms are these. The child appears as if it was asleep, only the eyelids are not quite closed; and if you observe them narrowly, you will see the eyes frequently twinkle, with the white of them turned up. There is a kind of tremulous motion in the muscles of the face and lips, which produces something like a simper or a smile, and sometimes almost the appearance of a laugh. As the disorder increases, the infant's breath seems now and then to stop for a little; the nose becomes pinched; there is a pale circle about the eyes and mouth, which sometimes changes to livid, and comes and goes by turns; the child starts, especially if you go to stir it though ever so gently, or if you make any noise near it. Thus disturbed, it sighs, or breaks wind, which gives relief for a little, but presently it relapses into the dozing. Sometimes it struggles hard before it can break wind, and seems as if falling into convulsions; but a violent burst of wind from the stomach, or vomiting, or a loud fit of crying, sets all to rights again. As the child increases in strength, these fits are the more apt to go off spontaneously and by degrees; but in case they do not, and if there is nothing done to remove them, they either degenerate into an almost constant drowsiness, (which is succeeded by a fever and the thrush), or else they terminate in vomitings, sour, curdled, or green stools, the watery-gripes, and convulsions. The thrush indeed very often terminates in these last symptoms. Wherefore, as these complaints naturally run into one another, or succeed one another, they may be considered, in a manner, as only different stages of the same disease, and which derive their origin from the same cause. Thus, the inward fits may be looked upon as the first stage of the disorder; the fever, and thrush (when it happens), as the second; the vomitings, sour, curdled, green or watery stools, as the third; and convulsions, as the last.

As to the cause of these complaints, he observes, that in infants the glandular secretions, which are all more or less glutinous, are much more copious than in adults. During the time of sucking, the glands of the mouth and fauces being squeezed by the contraction of the muscles, spue out their contents plentifully; which afterwards mixing with the mucus of the gullet and stomach, render the milk of a slimy consistence, by which means it is not so readily absorbed into the lacteals; and as in most infants there is too great an acidity in the stomach, the milk is thereby curdled, which adds to the load; hence sickness and spasms, which, being communicated by sympathy to the nerves of the gullet and fauces, produce the convulsive motions above described, which go commonly by the name of *inward fits*. The air, likewise, which is drawn in during suction, mixing with the milk, &c. in the stomach, perhaps contributes towards increasing the spasms above-mentioned. Dr Armstrong is the more induced to attribute these fits to the causes now assigned, that they always appear immediately after sucking or feeding; especially if the child has been long at the breast, or fed heartily, and has been laid down to sleep without having first broken wind, which ought never to be done. Another reason is, that nothing relieves them so soon as belching or vomiting; and the milk or food they throw up is generally either curdled, or mixed with a large quantity of heavy phlegm. In case they are not relieved by belching or vomiting, the fits sometimes continue a good while, and gradually abate, according as the contents of the stomach are pushed into the intestines; and as soon as the former is pretty well emptied, the child is waked by hunger, cries, and wants the breast; he sucks, and the same process is repeated.—Thus, some children for the first weeks are kept almost always in a dose, or seemingly so; especially if the nurses, either through laziness or want of skill, do not take care to rouse them when they perceive that it is not a right sleep, and keep them awake at proper intervals. This dozing is reckoned a bad sign amongst experienced nurses; who look upon it as a forerunner of the thrush, as indeed it often is; and therefore, when it happens, we ought to be upon our guard to use the necessary precautions for preventing that disorder.

For these disorders, the only remedy recommended by Dr Armstrong is antimonial wine, given in a few drops, according to the age of the infant. By this means the superabundant mucus will no doubt be evacuated; but at the same time we must remember, that this evacuation can only *palliate*, and not cure the disease. This can only be effected by tonics; and a decoction of the Peruvian bark, made into a syrup, will readily be taken by infants, and may be safely exhibited from the very day they come into the world, or as soon as their bowels are emptied of the meconium by the mother's milk or any other means.

Dr Clarke observes, that *fractures* of the *limbs*, and *compressions* of the *brain*, often happen in difficult labours; and that the latter are often followed by convulsions soon after delivery. In these cases, he says, it will be advisable to let the navel-string bleed two or three spoonfuls before it be tied. Thus the oppression of the brain will be relieved, and the disagreeable consequences just mentioned will be prevented. But if this has been neglected, and fits have actually come on, we must endeavour to make a revulsion by all the means in our power; as by opening the jugular vein, procuring an immediate discharge of the urine and meconium, and applying small blisters to the back, legs, or behind the ears. The semicupium, too, would seem to be useful in this case, by driving the oppressive load of fluids from the head and upper parts.

It

It sometimes happens after a tedious labour, that the child is so faint and weak as to discover little or no signs of life. In such a case, after the usual cleansing, the body should be immediately wrapped in warm flannel, and briskly tossed about in the nurse's arms, in order, if possible, to excite the languid circulation. If this fail, the breast and temples may be rubbed with brandy or other spirits; or the child may be provoked to cry, by whipping, or other stimulating methods, as the application of onion, or salt and spirit of hartshorn, to the mouth and nostrils. But after all these expedients have been tried in vain, and the recovery of the child absolutely despaired of, it has sometimes been happily revived by introducing a short catheter or blow-pipe into the mouth, and gently blowing into the lungs at different intervals. Such children, however, are apt to remain weak for a considerable time, so that it is often no easy matter to rear them; and therefore particular care and tenderness will be required in their management, that nothing may be omitted which can contribute either to their preservation or the improvement of their strength and vigour.

All the disorders which arise from a *retention* of the *meconium*, such as the *red gum*, may easily be removed by the use of gentle laxatives; but the great source of mortality among children is the *breeding* of their *teeth*. The usual symptoms produced by this are fretting; restlessness; frequent and sudden startings, especially in sleep; costiveness; and sometimes a violent diarrhœa, fever, or convulsions. In general, those children breed their teeth with the greatest ease, who have a moderate laxity of the bowels, or a plentiful flow of saliva during that time.

In mild cases, we need only, when necessary, endeavour to promote the means by which nature is observed to carry on the business of dentition in the easiest manner. For this purpose, if a costiveness be threatened, it must be prevented, and the body kept always gently open; and the gums should be relaxed by rubbing them frequently with sweet oils, or other softening remedies of that kind, which will greatly diminish the tension and pain. At the same time, as children about this period are generally disposed to chew whatever they get into their hands, they ought never to be without something that will yield a little to the pressure of their gums, as a crust of bread, a wax-candle, a bit of liquorice-root, or such like; for the repeated muscular action, occasioned by the constant biting and gnawing at such a substance, will increase the discharge from the salivary glands, while the gums will be so forcibly pressed against the advancing teeth, as to make them break out much sooner, and with less uneasiness, than would otherwise happen. Some likewise recommend a slice of the rind of fresh bacon, as a proper masticatory for the child, in order to bring moisture into its mouth, and facilitate the eruption of the teeth by exercising the gums. If these means, however, prove ineffectual, and bad symptoms begin to appear, the patient will often be relieved immediately by cutting the inflamed gum down to the tooth, where a small white point shows the latter to be coming forward. When the pulse is quick, the skin hot and dry, and the child of a sufficient age and strength, emptying the vessels by bleeding, especially at the jugular, will frequently be necessary here, as well as in all other inflammatory cases; and the belly should be opened from time to time by emollient oily or mucilaginous glysters. But, on the contrary, if the child be low, sunk, and much weakened, repeated doses of the spirit of hartshorn, and the like reviving medicines, ought to be prescribed. Blisters applied to the back, or behind the ears, will often be proper in both cases. A prudent administration of opiates, when their use is not forbid by costiveness or otherwise, is sometimes of great service in difficult teething, as, by mitigating pain, they have a tendency to prevent its bad effects, as a fever, convulsions, or other violent symptoms; and often they are absolutely necessary, along with the testaceous powders, for checking an immoderate diarrhœa.

When cathartics are necessary, but the child seems too tender and weak to bear their immediate operation, they should be given to the nurse; in which case they will communicate so much of their virtues to the milk as will be sufficient to purge the infant. This at least certainly holds with regard to some cathartics; such, for example, as the infusion of senna, particularly if a very weak infusion be employed, and not used to such an extent as to operate as a purgative to the nurse.

As most young children, if in health, naturally sleep much, and pretty soundly, we may always be apt to suspect that something is amiss when they begin to be subject to *watching* and *frights*; symptoms which seldom or never occur but either in consequence of some present disorder not yet taken notice of, or as the certain forerunners of an approaching indisposition. We should immediately, therefore, endeavour to find out their cause, that we may use every possible means to remove or prevent it; otherwise the want of natural rest, which is so very prejudicial to persons of all ages, will soon reduce the infant to a low and emaciated state, which may be followed by an hectic fever, diarrhœa, and all the other consequences of weakness and debility. These symptoms, being always the effects of irritation and pain, may proceed, in very young infants, from crudities or other affections of the *primæ viæ* producing flatulencies or gripes; about the sixth or seventh month, they may be owing to that uneasiness which commonly accompanies the breeding of the teeth; and after a child is weaned, and begins to use a different kind of food, worms become frequently an additional cause of watchings and disturbed sleep. Hence, to give the necessary relief on these occasions, the original complaint must first be ascertained from the child's age and other concomitant circumstances, and afterwards treated according to the nature of the case. Women and nurses are too apt to have recourse to opiates in the watchings of children, especially when their own rest happens to be much disturbed by their continual noise and clamour. But this practice is often prejudicial, and never ought to have place when the belly is in the least obstructed.

There is no complaint more frequent among children than that of worms, the general symptoms of which have been already enumerated; but it must be observed, that all the symptoms commonly attributed to worms alone, may be produced by a foulness of the bowels. Hence practitioners ought never to rest satisfied with administering to their patients such medicines

Diseases of Children.

cines as are possessed only of an anthelmintic quality, but to join them with those which are particularly adapted for cleansing the *primæ viæ;* as it is uncertain whether a foulness of the bowels may not be the cause of all the complaints. This practice is still the more advisable, on account of viscid humours in the intestines affording lodgment to the ova of worms; which, without the convenience of such a receptacle, would be more speedily discharged from the body.

The difficulty of curing what is called a *worm fever*, arises, according to Dr Musgrave, from its being frequently attributed to worms, when the cause of the disorder is of a quite different nature. He does not mean to deny that worms do sometimes abound in the human body, nor that the irritation caused by them does sometimes produce a fever; but he apprehends these cases to be much more uncommon than is generally imagined, and that great mischief is done by treating some of the disorders of children as worm cases, which really are not so. Dr Hunter, it is observed, is of the same opinion on this point; and he has, we are told, dissected great numbers of children who have been supposed to die of worm-fevers, and whose complaints were of course treated as proceeding from worms, in whom, however, there appeared, upon dissection, to be not only no worms, but evident proofs of the disorder's having been of a very different nature.

The *spurious worm-fever*, as Dr Musgrave terms it, has, in all the instances he has seen of it, arisen evidently from the children having been indulged with too great quantities of fruit; though a poor cold diet may, he thinks, occasionally give birth to it. Every sort of fruit eaten in excess will probably produce it; but an immoderate use of cherries seems to be the most common cause of it. The approach of this disorder has a different appearance, according as it arises from a habit of eating fruit in rather too large quantities, or from an excessive quantity eaten at one time. In the former case, the patient gradually grows weak and languid; his colour becomes pale and livid; his belly swells and grows hard; his appetite and digestion are destroyed; his nights grow restless, or at least his sleep is much disturbed with startings, and then the fever soon follows, in the progress of which, the patient grows comatose, and at times convulsed; in which state, when it takes place to a high degree, he often dies. The pulse at the wrist, though quick, is never strong or hard; the carotids, however, beat with great violence, and elevate the skin so as to be distinctly seen at a distance. The heat is at times considerable, especially in the trunk; though at other times, when the brain is much oppressed, it is little more than natural. It is sometimes accompanied by a violent pain of the epigastric region, though more commonly the pain is slight, and terminates in a coma; some degree of pain, however, seems to be inseparable from it, so as clearly to distinguish this disorder from other comatose affections.

When a large quantity of fruit has been eaten at once, the attack of the disorder is instantaneous, and its progress rapid; the patient often passing, in the space of a few hours, from apparently perfect health, to a stupid, comatose, and almost dying state. The symptoms of the fever, when formed, are in both cases nearly the same; except that, in this latter sort, a little purulent matter is sometimes discharged, both by vomit and stool, from the very first day. The stools, in both cases, exhibit sometimes a kind of curd resembling curdled milk, at other times a floating substance is observed in them; and sometimes a number of little threads and pellicles, and now and then a single worm.

Strong purgatives, or purges frequently repeated, in this disorder, are greatly condemned by Dr Armstrong, as they in general not only aggravate the symptoms already present, but are sometimes the origin of convulsions. Bloodletting is not to be thought of in any stage of the disorder.

Although frequent purging, however, be not recommended, yet a single vomit and purge are advised in the beginning of the disorder, with a view to evacuate such indigested matter and mucus as happens to remain in the stomach and bowels. These having operated properly, there is seldom occasion for repeating them; and it is sufficient, if the body be costive, to throw up, every second or third day, a clyster, composed of some grains of aloes, dissolved in five ounces of infusion of chamomile.

The principal part of the cure, however, depends upon external applications to the bowels and stomach; and as the cause of the disorder is of a cold nature, the applications must be warm, cordial, and invigorating; and their action must be promoted by constant actual heat.

The following is the form recommended.

"Take of leaves of wormwood and rue, each equal parts: make a saturated decoction in a sufficient quantity of water, with which foment the region of the stomach and abdomen for a quarter of an hour, repeating the fomentation every three or four hours. A poultice of the boiled herbs is to be applied after the fomentation, and constantly renewed as it cools." For internal use, the following is all that has been found necessary. "Take of spirituous and simple cinnamon-water, each half an ounce; oil of almonds, an ounce and an half; balsamic syrup, three drachms. Mix, and shake the vial when used." From two to six drachms are given every third hour.

When any nervous symptoms come on, or remain after the disorder is abated, they are easily removed by giving a pill with a grain or two of asafœtida once or twice a-day.

The diagnostics of worms are very uncertain; but, even in real worm cases, the treatment above recommended would, it is imagined, be much more efficacious than the practice commonly had recourse to. As worms either find the constitution weakly, or very soon make it so, the frequent repetition of purges, particularly mercurials, cannot but have a pernicious effect. Bares-foot is still more exceptionable, being in truth to be ranked rather among poisons than medicines. Worm-seed and bitters are too offensive to the palate and stomach to be long persisted in, though sometimes very useful. The powder of coralline creates disgust by its quantity; and the infusion of pink-root is well known to occasion now and then vertiginous complaints and fits.

Fomenting the belly night and morning with a strong decoction of rue and wormwood, is much recommended. It is a perfectly safe remedy, and, by invigorating the bowels, may thereby have some influence in rendering them capable of expelling such worms

Dif. of children. worms as they happen to contain. After the fomentation, it is advifed to anoint the belly with a liniment, compofed of one part of effential oil of rue, and two parts of a decoction of rue in fweet oil. It is, however, a matter of great doubt whether thefe external applications, in confequence of the articles with which they are impregnated, exert any influence on the worms themfelves.

The diet of children difpofed to worms, fhould be warm and nourifhing, confifting in part at leaft of animal food, which is not the worfe for being a little feafoned. Their drink may be any kind of beer that is well hopped, with now and then a fmall draught of porter or negus. A total abftinence from butter is not fo neceffary, perhaps, as is generally imagined. Poor cheefe muft by all means be avoided; but fuch as is rich and pungent, in a moderate quantity, is particularly ferviceable. In the fpurious worm-fever, the patient fhould be fupported occafionally by fmall quantities of broth; and, at the clofe of it, when the appetite returns, the firft food given fhould be of the kinds above recommended.

The diet here recommended will, perhaps, be thought extraordinary, as the general idea is at prefent, that, in the management of children, nothing is fo much to be avoided as repletion and rich food. It is no doubt an error to feed children too well, or to indulge them with wine and rich fauces; but it is equally an error to confine them to too ftrict or too poor a diet, which weakens their digeftion, and renders them much more fubject to diforders of every kind, but particularly to diforders of the bowels. In regard to the fpurious worm-fever, if it be true that acid fruits too plentifully eaten are the general caufe of it, it follows as a confequence, that a warm nutritious diet, moderately ufed, will moft effectually counteract the mifchief, and fooneft reftore the natural powers of the ftomach. Befides, if the diforder does not readily yield to the methods here directed, as there are many examples of its terminating by an inflammation and fuppuration of the navel, it is highly advifable to keep this probability in view, and, by a moderate allowance of animal-food, to fupport thofe powers of nature, from which only fuch a happy crifis is to be expected.

Of MEDICAL ELECTRICITY.

The application of this fubtile fluid to medicinal purpofes was thought of foon after the difcovery of the electric fhock; and after various turns of reputation, its medical virtues feem now to be pretty well eftablifhed. After giving fo particular a defcription of the electrical apparatus under the proper article, it would here be fuperfluous to fay any thing farther on that head. We fhall only obferve, that Mr Cavallo, who has publifhed the lateft and the beft treatife on Medical Electricity, entirely difapproves of giving violent fhocks, and finds it moft efficacious to expofe the patient to the electrical aura difcharged from an iron or a wooden point; or if fhocks are given, they fhould be very flight, and not exceed 12 or 14 at a time. In this way he recommends it as effectual in a great number of diforders. The patient may be electrified from three to ten minutes; but if fparks are drawn, they fhould not exceed the number of fhocks above mentioned. Medical Electricity.

Rheumatic diforders, even of long ftanding, are relieved, and generally quite cured, by only drawing the electric fluid with a wooden point from the part, or by drawing fparks through flannel. The operation fhould be continued for about four or five minutes, repeating it once or twice every day.

Deafnefs, except when it is occafioned by obliteration or other improper configuration of the parts, is either entirely or partly cured by drawing the fparks from the ear with the glafs-tube director, or by drawing the fluid with a wooden point. Sometimes it is not improper to fend exceedingly fmall fhocks (for inftance, of one-thirteenth of an inch) from one ear to the other.—It has been conftantly obferved, that whenever the ear is electrified, the difcharge of the wax is confiderably promoted.

The toothach, occafioned by cold, rheumatifm, or inflammation, is generally relieved by drawing the electric fluid with a point, immediately from the part, and alfo externally from the face. But when the body of the tooth is affected, electrifation is of no ufe; for it feldom or never relieves the diforder, and fometimes increafes the pain to a prodigious degree.

Swellings in general, which do not contain any *matter*, are frequently cured by drawing the electric fluid with a wooden point. The operation fhould be continued for three or four minutes every day.—It is very remarkable, that in fome cafes of white fwellings, quite cured by means of electricity, the bones and cartilages were in fome meafure disfigured.

Inflammations of every fort are generally relieved by a very gentle electrization.

In inflammations of the eyes, the throwing of the electric fluid by means of a wooden point is often attended with great benefit; the pain being quickly abated, and the inflammation being generally diffipated in a few days. In thefe cafes, the eye of the patient muft be kept open; and care fhould be taken not to bring the wooden point very near it, for fear of caufing any fpark. Sometimes it is fufficient to throw the fluid with a metal point; for in thefe cafes, too great an irritation fhould be always avoided. It is not neceffary to continue this operation for three or four minutes without intermiffion; but after throwing the fluid for about half a minute, a fhort time may be allowed to the patient to reft and to wipe his tears, which generally flow very copioufly; then the operation may be continued again for another half minute, and fo on for four or five times every day.

The *gutta ferena* has been fometimes cured by electrization; but at the fame time it muft be confeffed, it has proved ineffectual in many fuch cafes, in which it was adminiftered for a long time and with all poffible attention. However, it has never been known that any body was made worfe by it. The beft method of adminiftering electricity in fuch cafes, is firft to draw the electric fluid with a wooden point for a fhort time, and then to fend about half a dozen of fhocks of one-twentieth of an inch from the back and lower part of the head to the fore head, very little above the eye.

A remarkable difeafe of the eye was fome time ago perfectly cured by electrization; it was an opacity of the vitreous humour of the eyes.

Medical Electricity.

All the cafes of *fiftula lacrymalis* which Mr Cavallo hath known to have been electrified by perfons of ability for a fufficient time, have been entirely cured. The method generally practifed has been that of drawing the fluid with a wooden point, and to take very fmall fparks from the part. The operation may be continued for about three or four minutes every day. It is remarkable, that in thofe cafes, after curing the fiftula lacrymalis, no other difeafe was occafioned by it, as blindnefs, inflammations, &c. by fuppreffing that difcharge.

Palfies are feldom perfectly cured by means of electricity, efpecially when they are of long ftanding; but they are generally relieved to a certain degree. The method of electrifying in thofe cafes, is to draw the fluid with the wooden point, and to draw fparks thro' flannel, or through the ufual coverings of the part if they are not too thick. The operation may be continued for about five minutes per day.

Ulcers, or open fores of every kind, even of a long ftanding, are generally difpofed to heal by electrization. The general effects are a diminution of the inflammation, and at firft a promotion of the difcharge of properly formed matter; which difcharge gradually leffens, according as the limits of the fore contract, till it be quite cured. In thefe cafes the gentleft electrization muft be ufed, in order to avoid too great an irritation, which is generally hurtful. To draw or throw the fluid with a wooden or even with a metal point, for three or four minutes per day, is fully fufficient.

Cutaneous eruptions have been fuccefsfully treated with electrization: but in thefe cafes it muft be obferved, that if the wooden point be kept too near the fkin, fo as to caufe any confiderable irritation, the eruption will be caufed to fpread more; but if the point be kept at about fix inches diftance, or farther, if the electrical machine be very powerful, the eruptions will be gradually diminifhed, till they are quite cured. In this kind of difeafe, the immediate and general effect of the wooden point is to occafion a warmth about the electrified part, which is always a fign that the electrization is rightly adminiftered.

The application of electricity has perfectly cured various cafes of *St Vitus's dance*, or of that difeafe which is commonly called fo; for it is the opinion of fome very learned phyficians, that the real difeafe called *St Vitus's dance*, which formerly was more frequent than it is at prefent, is different from that which now goes under that name. In this difeafe fhocks of about one-tenth of an inch may be fent through the body in various directions, and alfo fparks may be taken. But if this treatment prove very difagreeable to the patient, then the fhocks muft be leffened, and even omitted; inftead of which, fome other more gentle applications muft be fubftituted.

Scrophulous tumors, when they are juft beginning, are generally cured by drawing the electric fluid with a wooden or metal point from the part. This is one of thofe kinds of difeafes in which the action of electricity requires particularly the aid of other medicines in order to effect a cure more eafily; for fcrophulous affections commonly accompany a great laxity of the habit, and a general cachexy, which muft be obviated by proper remedies.

In *cancers*, the pains only are commonly alleviated by drawing the electric fluid with a wooden or metal point. Mr Cavallo, however, mentions one cafe in which a moft confirmed cancer of very long ftanding, on the breaft of a woman, had been much reduced in fize. It is remarkable, that this patient was fo far relieved by drawing the fluid with a metal point from the part, that the excruciating pains fhe had fuffered for many years did almoft entirely difappear; and alfo, that when the electric fluid was drawn by means of a wooden point, the pains did rather increafe.

Abfceffes, when they are in their beginning, and in general whenever there is any tendency to form matter, are difperfed by electrization. Lately, in a cafe in which matter was formed upon the hip, called the *lumbar abfcefs*, the difeafe was perfectly cured by means of electricity. The *fciatica* has alfo been often cured by it. In all fuch cafes, the electric fluid muft be fent through the part by means of two directors applied to oppofite parts, and in immediate contact either with the fkin, or with the coverings, when thefe are very thin. It is very remarkable, that the mere paffage of the electric fluid in this manner is generally felt by the patients afflicted with thofe diforders, nearly as much as a fmall fhock is felt by a perfon in good health. Sometimes a few fhocks have been alfo given, but it feems more proper to omit them; becaufe fometimes, inftead of difperfing, they rather accelerate the formation of matter.

In cafes of *pulmonary inflammations*, when they are in the beginning, electrization has been fometimes beneficial; but in confirmed difeafes of the lungs, it does not feem to have ever afforded any unqueftionable benefit; however, it feems that in fuch cafes the power of electricity has been but feldom tried.

Nervous headachs, even of a long ftanding, are generally cured by electrization. For this difeafe, the electric fluid muft be thrown with a wooden, and fometimes even with a metal point, all round the head fucceffively. Sometimes exceedingly fmall fhocks have been adminiftered; but thefe can feldom be ufed, becaufe the nerves of perfons fubject to this difeafe are fo very irritable, that the fhocks, the fparks, and fometimes even the throwing the electric fluid with a wooden point kept very near the head, throw them into convulfions.

The application of electricity has often been found beneficial in the *dropfy* when juft beginning, or rather in the tendency to a dropfy; but it has never been of any ufe in advanced dropfies. In fuch cafes, the electric fluid is fent through the part, in various directions, by means of two directors, and fparks are alfo drawn acrofs the flannel or the cloaths; keeping the metal rod in contact with them, and fhifting it continually from place to place. This operation fhould be continued at leaft ten minutes, and fhould be repeated once or twice a-day.—Perhaps in thofe cafes, a fimple electrization (viz. to infulate the patient, and to connect him with the prime conductor whilft the machine is an action), continued for a confiderable time, as an hour or two, would be more beneficial.

The *gout*, extraordinary as it may appear, has certainly been cured by means of electricity, in various inftances. The pain has been generally mitigated, and fometimes the difeafe has been removed fo well as not to

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to return again. In thoſe caſes, the electric fluid has been thrown by means of a wooden point, although ſometimes, when the pain was too great, a metal point only has been uſed.

Agues have not unfrequently been cured by electricity, ſo that ſometimes one electrization or two have been ſufficient. The moſt effectual and ſure method has been that of drawing ſparks through flannel, or the cloaths, for about ten minutes or a quarter of an hour. The patients may be electrified either at the time of the fit, or a ſhort while before the time in which it is expected.

The ſuppreſſion of the menſes, which is a diſeaſe of the female ſex that often occaſions the moſt diſagreeable and alarming ſymptoms, is often ſucceſsfully and ſpeedily cured by means of electricity, even when the diſeaſe is of long ſtanding, and after the moſt powerful medicines uſed for it have proved ineffectual The caſes of this ſort in which electrization has proved uſeleſs are ſo few, and the ſucceſsful ones ſo numerous, that the application of electricity for this diſeaſe may be juſtly conſidered as an efficacious and certain remedy. Great attention and knowledge is required, in order to diſtinguiſh the arreſt of the menſes from a ſtate of pregnancy. In the former, the application of electricity, as we obſerved above, is very beneficial; whereas, in the latter, it may be attended with very diſagreeable effects: it is therefore a matter of great importance to aſcertain the real cauſe of the diſeaſe, before the electricity be applied in thoſe caſes. Pregnant women may be electrified for other diſeaſes, but always uſing very gentle means, and directing the electric fluid through other parts of the body diſtant from thoſe ſubſervient to generation. In the real ſuppreſſion of the menſes, ſmall ſhocks, *i. e.* of about one twentieth of an inch, may be ſent through the pelvis; ſparks may be taken through the cloaths from the parts adjacent to the ſeat of the diſeaſe; and alſo the electric fluid may be tranſmitted by applying the metallic or wooden extremities of two directors to the hips, in contact with the clothes; part of which may be removed in caſe they be too thick. Thoſe various applications of electricity ſhould be regulated according to the conſtitution of the patient The number of ſhocks may be about 12 or 14 The other applications may be continued for two or three minutes; repeating the operation every day. But either ſtrong ſhocks, or a ſtronger application of electricity than the patient can conveniently bear, ſhould be carefully avoided; for by thoſe means, ſometimes more than a ſufficient diſcharge is occaſioned, which is not eaſily cured In caſes of uterine hæmorrhagie, it is not known that the application of electricity was ever beneficial. Perhaps a very gentle electrization, ſo as to keep the patient inſulated and connected with the prime conductor, whilſt the electrical machine is in action, may be of ſome benefit.

In reſpect to *unnatural diſcharges* and *fluxus* in general, it may be obſerved, that ſome diſcharges are quite unnatural or adventitious, as the fiſtula lacrymalis, and ſome ſpecies of the venereal diſeaſe; but others are only increaſed natural diſcharges, ſuch as the menſes, perſpiration, &c. Now the power of electricity in general has been found more beneficial for the firſt than for the ſecond ſort of diſcharges, which are moſtly increaſed by it.

In the *venereal diſeaſe*, electrization has been generally forbidden; having commonly increaſed the pains, and other ſymptoms, rather than diminiſhed them. Indeed, conſidering that any ſort of ſtimulus has been found hurtful to perſons afflicted with that diſorder, it is no wonder that electricity has produced ſome bad effects, eſpecially in the manner it was adminiſtered ſome time ago, viz. by giving ſtrong ſhocks. However, it has been lately obſerved, that a very gentle application of electricity, as drawing the fluid by means of a wooden or metal point, is peculiarly beneficial in various caſes of this kind, even when the diſeaſe has been of long ſtanding. Having remarked above, that tumors, when juſt beginning, are diſperſed, and that unnatural diſcharges are gradually ſuppreſſed by a judicious electrization, it is ſuperfluous to deſcribe particularly thoſe ſtates of the venereal diſeaſe in which electricity may be applied; it is only neceſſary to remind the operator to avoid any conſiderable ſtimulus in caſes of this ſort.

The application of electricity has been found alſo beneficial in other diſeaſes beſides thoſe mentioned above; but as the facts are not ſufficiently numerous, ſo as to afford the deduction of any general rules, we have not thought proper to take any particular notice of them.

We may laſtly obſerve, that, in many caſes, the help of other remedies to be preſcribed by the medical practitioner will be required to aſſiſt the action of electricity, which by itſelf would perhaps be uſeleſs; and, on the other hand, electrization may often be applied to aſſiſt the action of other remedies, as of ſudorifics, ſtrengthening medicines, &c.

Of FIXED AIR *as a* MEDICINE. 412

THE antiſeptic qualities of fixed air, or as it is now more generally called of the *aerial* or *carbonic acid*, have of late introduced it as a medicine in caſes of putrid diſorders, and various other complaints.—Dr Percival obſerves, that though fatal if inſpired in a very large quantity, it may in ſmaller quantities be breathed without danger or uneaſineſs. And it is a confirmation of this concluſion, that at Bath, where the waters copiouſly exhale this mineral ſpirit, the bathers inſpire it with impunity. At Buxton alſo, where the bath is in a cloſe vault, the effects of ſuch effluvia, if noxious, muſt certainly be perceived.

Encouraged by theſe and ſome other conſiderations, he has adminiſtered fixed air in more than 20 caſes of the *phthiſis pulmonalis*, by directing his patients to inſpire the ſteams of an efferveſcing mixture of chalk and vinegar through the ſpout of a coffee-pot. The hectic fever has in ſeveral inſtances been conſiderably abated, and the matter expectorated has become leſs offenſive and better digeſted. He has not, however, been ſo fortunate in any one caſe as to effect a cure; although the uſe of mephitic air has been accompanied with proper internal medicines. But Dr Withering has been more ſucceſsful. One phthiſical patient under his care, by a ſimilar courſe, entirely recovered; another was rendered much better; and a third, whoſe caſe was truly deplorable, ſeemed to be kept alive by it

Fixed Air. it more than two months. It may be proper to observe, that fixed air can only be employed with any prospect of success in the latter stages of the *phthisis pulmonalis*, when a purulent expectoration takes place. After the rupture and discharge of a vomica also, such a remedy promises to be a powerful palliative. Antiseptic fumigations and vapours have been long employed, and much extolled, in cases of this kind. The following experiment was made to determine whether their efficacy in any degree depends on the separation of fixed air from their substance.

One end of a bent tube was fixed in a phial full of lime-water; the other end in a bottle of the tincture of myrrh. The junctures were carefully luted; and the phial containing the tincture of myrrh was placed in water, heated almost to the boiling point, by the lamp of a tea-kettle. A number of air-bubbles were separated, but probably not of the mephitic kind; for no precipitation ensued in the lime-water. This experiment was repeated with the *tinct. Tolutana Ph. Ed.* and with *sp. vinos. camph.* and the result was entirely the same. The medicinal action therefore of the vapours raised from such tinctures, cannot be ascribed to the extrication of fixed air; of which it is probable bodies are deprived by chemical solution as well as by mixture.

If mephitic air be thus capable of correcting purulent matter in the lungs, we may reasonably infer it will be equally useful when applied externally to *foul ulcers*; and experience confirms the conclusion. Even the sanies of a cancer, when the carrot-poultice failed, has been sweetened by it, the pain mitigated, and a better digestion produced. But though the progress of the cancer seems to be checked by the fixed air, it is to be feared that a cure will not be effected. A palliative remedy, however, in a disease so desperate and loathsome, may be considered as a very valuable acquisition. Perhaps nitrous air might be still more efficacious. This species of factitious air is obtained from all the metals, except zinc, by means of the nitrous acid; as a sweetener and antiseptic, it far surpasses fixed air.

In the ulcerous *sore throat*, much advantage has been experienced from the vapours of effervescing mixtures drawn into the *fauces*. But this remedy should not supersede the use of other antiseptic applications.

In *malignant fevers*, wines abounding with fixed air may be administered to check the septic ferment, and sweeten the putrid *colluvies* in the *primæ viæ*. If the laxative quality of such liquors be thought an objection to the use of them, wines of a greater age may be given, impregnated with aerial acid.—The patient's common drink might also be medicated in the same way. A putrid diarrhœa frequently occurs in the latter stage of such disorders; and it is a most alarming and dangerous symptom. If the discharge be stopped by astringents, a putrid *fomes* is retained in the body, which aggravates the delirium, and increases the fever. On the contrary, if it be suffered to take its course, the strength of the patient must soon be exhausted, and death unavoidably ensue. The injection of mephitic air into the intestines, under these circumstances, bids fair to be highly serviceable. And in some cases of this kind, the gas emitted from a mixture of chalk and oil of vitriol conveyed into the body by the machine employed for tobacco-clysters, quickly restrained the diarrhœa, corrected the heat and fetor of the stools, and in a short time removed every symptom of danger. Fixed Air.

As a *solvent* of the *calculus*, its virtues have been already mentioned; but the experiments made on that subject do not determine the matter with sufficient accuracy.

Observations on the MEANS *of Preserving* HEALTH.

I. RULES *for the Management of* VALETUDINARIANS. 413

THAT part of the medical system which lays down rules for the preservation of health, and prevention of diseases, termed *Hygeine*, is not to be strictly understood as if it respected only those people who enjoy perfect health, and who are under no apprehensions of disease, for such seldom either desire or attend to medical advice; but should rather be considered as relating to valetudinarians, or to such as, though not actually sick, may yet have sufficient reason to fear that they will soon become so: hence it is that the rules must be applied to correct morbific dispositions, and to obviate the various things that were shown to be the remote or possible causes of diseases.

From the way in which the several temperaments are usually mentioned by systematic writers, it should seem as if they meant that every particular constitution must be referred to one or other of the four; but this is far from being reducible to practice, since by much the greater number of people have constitutions so indistinctly marked, that it is hard to say to which of the temperaments they belong.

When we actually meet with particular persons who have evidently either,

1. Too much strength and rigidity of fibre, and too much sensibility;

2. Too little strength, and yet too much sensibility;

3. Too much strength, and but little sensibility; or,

4. But little sensibility joined to weakness;

we should look on such persons as more or less in the valetudinary state, who require that these morbific dispositions be particularly watched, lest they fall into those diseases which are allied to the different temperaments.

People of the first-mentioned temperament being liable to suffer from continued fevers, especially of the inflammatory species, their scheme of preserving health should consist in temperate living, with respect both to diet and exercise; they should studiously avoid immoderate drinking, and be remarkably cautious lest any of the natural discharges be checked. People of this habit bear evacuations well, especially bleeding: they ought not, however, to lose blood but when they really require to have the quantity lessened; because too much of this evacuation would be apt to reduce the constitution to the second-mentioned temperament, wherein strength is deficient, but sensibility redundant.

Persons of the second temperament are remarkably prone to suffer from painful and spasmodic diseases, and are easily ruffled; and those of the softer sex who have this

Means of preserving Health.

this delicacy of habit, are very much difpofed to hyfterical complaints. The fcheme here fhould be, to ftrengthen the folids by moderate exercife, cold bathing, the Peruvian bark, and chalybeate waters; particular attention fhould conftantly be had to the ftate of the digeftive organs, to prevent them from being overloaded with any fpecies of faburra which might engender flatus, or irritate the fenfible membranes of the ftomach and inteftines, from whence the diforder would foon be communicated to the whole nervous fyftem. Perfons of this conftitution fhould never take any of the draftic purges, nor ftrong emetics; neither fhould they lofe blood but in cafes of urgent neceffity. But a principal fhare of management, in thefe extremely irritable conftitutions, confifts in avoiding all fudden changes of every fort, efpecially thofe with refpect to diet and clothing, and in keeping the mind as much as poffible in a ftate of tranquillity: hence the great advantages which people of this frame derive from the ufe of medicinal waters drunk on the fpot, becaufe of that freedom from care and ferious bufinefs of every kind, which generally obtains in all the places laid out for the reception of valetudinarians.

The third-mentioned temperament, where there is an excefs of ftrength and but little fenfibility, does not feem remarkably prone to any diftreffing or dangerous fpecies of difeafe; and therefore it can hardly be fuppofed that perfons fo circumftanced will either of themfelves think of any particular fcheme of management, or have recourfe to the faculty for their inftructions: fuch conftitutions, however, we may obferve, bear all kinds of evacuations well, and fometimes require them to prevent an over-fulnefs, which might end in an oppreffion of the brain or fome other organ of importance.

But the fourth temperament, where we have weaknefs joined to want of fenfibility, is exceedingly apt to fall into tedious and dangerous difeafes, arifing from a defect of abforbent power in the proper fets of veffels, and from remiffnefs of the circulation in general: whence corpulency, dropfy, jaundice, and different degrees of fcorbutic affection. In order to prevent thefe, or any other fpecies of accumulation and depravation of the animal fluids, the people of this conftitution fhould ufe a generous courfe of diet, with brifk exercife, and be careful that none of the fecretions be interrupted, nor any of the natural difcharges fuppreffed. Thefe conftitutions bear purging well, and often require it; as alfo the ufe of emetics, which are frequently found neceffary to fupply the place of exercife, by agitating the abdominal vifcera, and are of fervice to prevent the ftagnation of bile, or the accumulation of mucous humours, which hinder digeftion, and clog the firft paffages. The free ufe of muftard, horfe-radifh, and the like fort of ftimulating dietetics, is ferviceable in thefe torpid habits

When the general mafs of fluids is accumulated beyond what is conducive to the perfection of health, there arifes what the writers term a *plethora*, which may prove the fource of different difeafes; and therefore, when this overfulnefs begins to produce languor and oppreffion, care fhould be taken in time to reduce the body to a proper ftandard, by abridging the food and increafing the natural difcharges, ufing more exercife, and indulging lefs in fleep.

But in oppofite circumftances, where the fluids have been exhaufted, we are to attempt the prevention of further wafte by the ufe of ftrengthening ftomachics, nourifhing diet, and indulgence from fatigue of body or mind.

Vitiated fluids are to be confidered as affected either with the different kinds of general acrimony, or as betraying figns of fome of the fpecies of morbific matter which give rife to particular difeafes, fuch as gout, rheumatifm, calculus, fcurvy, &c.

During the ftate of infancy, we may fometimes obferve a remarkable acidity, which not only fhows itfelf in the firft paffages, but alfo feems to contaminate the general mafs of fluids. As it takes its rife, however, from weak bowels, our views, when we mean to prevent the ill confequences, muft be chiefly directed to ftrengthen the digeftive organs, as on their foundnefs the preparation of good chyle depends; and hence fmall dofes of rhubarb and chalybeates (either the natural chalybeate waters mixed with milk, or the *flores martiales* in dofes of a few grains, according to the age of the child), are to be adminiftered; and the diet is to be fo regulated as not to add to this acid tendency: brifk exercife is likewife to be enjoined, with frictions on the ftomach, belly, and lower extremities.

Where the fluids tend to the putrefcent ftate, which fhows itfelf by fetid breath, fponginefs, and bleeding of the gums, a bloated look and livid caft, the diet then fhould be chiefly of frefh vegetables and ripe fruits, with wine in moderation, brifk exercife, and ftrengthening bitters.

Where acrimony fhows itfelf by itching eruptions, uncommon thirft, and flufhing heats, nothing will anfwer better than fuch fulphureous waters as the Harrowgate and Moffat in Britain, or the Lucan and Swadlinbar in Ireland; at the fame time ufing a courfe of diet that fhall be neither acrid nor heating.

So far with refpect to thofe kinds of morbific matter which do not invariably produce a particular fpecies of difeafe: but there are others of a fpecific nature, fome of which are generated in the body fpontaneoufly, and feem to arife from errors in diet, or other circumftances of ill management with refpect to the animal economy; and hence it is fometimes poffible, in fome degree if not altogether, to prevent the ill confequences. Thus, there are inftances where returns of the gout have been prevented by adhering ftrictly to a milk diet.

The rheumatifm has alfo been fometimes warded off by wearing a flannel fhirt, or by ufing the cold bath without interruption.

Calculus may be retarded in its progrefs, and prevented from creating much diftrefs, by the internal ufe of foap and lime-water, by foap-lees taken in milk or in veal-broth, or by the ufe of aerated alkaline water, which may perhaps be confidered as being both more fafe and more efficacious, and at the fame time more pleafant, than any of the other practices.

The fcurvy may be prevented by warm clothing and perfeverance in brifk exercife, by drinking wine or cyder, and eating freely of fuch vegetable fubftances as can be had in thofe fituations where this difeafe is moft apt to fhow itfelf.

In conftitutions where there is an hereditary difpo-

Means of preferving Health.

fition to the fcrofula, if early precautions be taken to ftrengthen the folids by cold bathing, a nourifhing courfe of diet, and moderate ufe of wine, the acrimony which gives rife to the difeafe will probably be prevented from producing any very bad effects.

The other kinds of morbific matter, which are of the fpecific nature, are received into the body by infection or contagion.

The infection of a putrid fever or dyfentery is beft prevented by immediately taking an emetic on the firft attack of the ficknefs or fhivering; and if that do not completely anfwer, let a large blifter be applied between the fhoulders: by this method the nurfes and other attendants on the fick in the naval hofpitals have often been preferved. As to other infectious morbific matter, we muft refer to what has already been faid when treating of hydrophobia, poifons, &c.

The ill effects which may arife from the different fpecies of faburra, are to be obviated, in general, by the prudent adminiftration of emetics, and carefully abftaining from fuch kinds of food as are known to caufe the accumulation of noxious matters in the firft paffages.

Crude vegetables, milk, butter, and other oily fubftances, are to be avoided by perfons troubled with a fournefs in the ftomach; brifk exercife, efpecially riding, is to be ufed, and they are to refrain from fermented liquors: the common drink fhould be pure water; or water with a very little of fome ardent fpirit, fuch as rum or brandy. Seltzer and Vahls water are to be drunk medicinally; and aromatic bitters, infufions, or tinctures, with the acid elixir of vitriol, from 10 to 20 drops, will be found ferviceable, in order to ftrengthen the fibres of the ftomach, and promote the expulfion of its contents, thereby preventing the too hafty fermentation of the alimentary mixture. In order to procure immediate relief, magnefia alba, or *creta præparata*, will feldom fail; the magnefia, as well as the chalk, may be made into lozenges, with a little fugar and mucilage; and in that form may be carried about and taken occafionally by people afflicted with the acid faburra.

In conftitutions where there is an exuberance or ftagnation of bile, and a troublefome bitternefs in the mouth, it is neceffary to keep the bowels always free, by taking occafionally fmall dofes of pure aloes, *oleum ricini*, cream of tartar, fome of the common purging falts, or the natural purging waters.

When there is a tendency to the empyreumatic and rancid faburra, people fhould carefully avoid all the various kinds of thofe oily and high-feafoned things generally termed *made-difhes*, and eat fparingly of plain meat, without rich fauces or much gravy; and in thefe cafes the moft proper drink is pure water.

414 II. Rules *for thofe who enjoy perfect* Health.

There can be no doubt, that, in general, temperance is the true foundation of health; and yet the ancient phyficians, as we may fee in the rules laid down by Celfus, did not fcruple to recommend indulgence now and then, and allowed people to exceed both in eating and drinking: but it is fafer to proceed to excefs in drink than in meat; and if the debauch fhould create any extraordinary or diftreffing degree of pain or ficknefs, and a temporary fever fhould enfue, there are two ways of fhaking it off, either to lie in bed and encourage perfpiration, or to get on horfe-back and by brifk exercife reftore the body to its natural ftate. The choice of thefe two methods muft always be determined by the peculiar circumftances of the parties concerned, and from the experience which they may before have had which agrees beft with them.

If a perfon fhould commit excefs in eating, efpecially of high-feafoned things, with rich fauces, a draught of cold water, acidulated with vitriolic acid, will take off the fenfe of weight at the ftomach, and affift digeftion, by moderating and keeping within bounds the alimentary fermentation, and thus preventing the generation of too much flatus. The luxury of ices may be here of real fervice at the tables of the great, as producing fimilar effects with the cold water acidulated. Perfons in thefe circumftances ought not to lay themfelves down to fleep, but fhould keep up and exercife until they are fenfible that the ftomach is unloaded, and that they no longer feel any oppreffive weight about the præcordia.

If a man be obliged to faft, he ought, if poffible, during that time, to avoid laborious work: after fuffering fevere hunger, people ought not at once to gorge and fill themfelves; nor is it proper, after being overfilled, to enjoin an abfolute faft: neither is it fafe to reft totally immediately after exceffive labour, nor fuddenly fall hard to work after having been long without motion: in a word, all changes fhould be made by gentle degrees; for though the conftitution of the human body be fuch that it can bear many alterations and irregularities without much danger, yet, when the tranfitions are extremely fudden, they cannot fail of producing fome kind or degree of diforder.

It is alfo the advice of Celfus to vary the fcenes of life, and not confine ourfelves to any fettled rules: but as inaction renders the body weak and liftlefs, and exercife gives vigour and ftrength, people fhould never long omit riding, walking, or going abroad in a carriage; fencing, playing at tennis, dancing, or other fimilar engagements, which afford both exercife and amufement, as each fhall be found moft agreeable or convenient, are to be ufed in their turns, according to the circumftances and tendency to any particular fpecies of difeafe. But when the weaknefs of old age fhall have rendered the body incapable of all thefe, then dry frictions with the flefhbrufh will be extremely requifite to preferve health, by accelerating the flow of humours through the fmalleft orders of veffels, and preventing the fluids from ftagnating too long in the cellular interftices of the flefhy parts.

Sleep is the great reftorer of ftrength; for, during this time, the nutritious particles appear to be chiefly applied to repair the wafte, and replace thofe that have been abraded and wafhed off by the labour and exercife of the day; but too much indulgence in fleep has many inconveniencies, both with refpect to body and mind, as it blunts the fenfes, and encourages the fluids to ftagnate in the cellular membrane whence corpulency, and its neceffary confequences languor and weaknefs.

The proper time for fleep is the night feafon, when darknefs

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of darkness and silence naturally bring it on: therefore day-sleep in general is not so refreshing; and to some people is really distressful, as creating an unusual giddiness and languor, especially in persons addicted to literary pursuits. Custom, however, frequently renders sleep in the day necessary; and in those constitutions where it is found to give real refreshment, it ought to be indulged.

With regard to the general regimen of diet, it has always been held as a rule, that the softer and milder kinds of aliment are most proper for children and younger subjects; that grown persons should eat what is more substantial; and old people lessen their quantity of solid food, and increase that of their drink.

I N D E X.

Gener-

Stab

Medicines || Medicis.

MEDICINES, whatever substances serve to restore health.—Medicines are either *simple* or *compound*; the former being prepared by nature alone; and the latter owing to the industry of man, by variously mixing the simple together. See PHARMACY.

MEDICINES are likewise distinguished from the manner of using them, into *external* and *internal*; and with regard to their effects, they are said to be *emetic*, *cathartic*, *astringent*, &c. See *MATERIA Medica*.

Pocket MEDICINES, in surgery, those which a surgeon ought always to carry about with him, in a box or convenient case.

Those, according to Heister, are the common digestive ointment, and some detergent ointment, for cleansing and digesting foul ulcers; to which must also be added a plaster or two fitted for defence or adhesion, since one or other of these is almost constantly wanted. Neither should there be wanting a piece of blue vitriol for the taking down luxuriant flesh, and to stop hemorrhagies: but if vitriol is wanting, burnt alum, red precipitate, the infernal stone, or any other corrosive medicine, will supply its place in corrosive intentions; and the last will also serve to open abscesses, to make issues, and perform many other operations of that kind.

With these there should always be kept in readiness also a quantity of scraped lint, that the surgeon may be able to give immediate assistance to wounded persons; since, if he is unprepared for this, they may easily be taken off by an hemorrhagy; a circumstance which ought also to prevail with him to be always provided with suitable bandages.

MEDICIS (Cosmo de), called the *Elder*, son of John de Medicis, was born at Florence Sept. 1389. Altho' in a private station, he appeared with the splendor of the most powerful sovereign; and his fortune, accumulated by successful commerce, was surpassed by the revenue of few princes. He was partial to the sciences, and liberal to men of genius. His library consisted of a vast number of books of his own collecting, and he enriched it with many scarce and valuable manuscripts. Banished from his native country by the envy which his riches inspired, he went to Venice, where he was received with the honours due to a sovereign prince. His countrymen soon perceived their error, and recalled him from banishment. For 34 years he was supreme judge of the republic; and his advice was solicited by the greater part of the cities and sovereignties of Italy. This great man died August 1464, in the 75th year of his age, full of happiness and glory. On his tombstone he is styled, "*Father of the people, and deliverer of his country.*"

MEDICIS (Laurence de), styled the *Great* and the *Father of learning*, was born A. D. 1448. He was the son of Peter, the grandson of Cosmo, and the brother of Julian de Medicis. These two brothers, who were in possession of absolute power at Florence, excited the jealousy of Ferdinand of Naples and Pope Sixtus IV. The first hated them, because they had ruined his influence in Florence; and the second, because they opposed the advancement of his nephew. It was at their instigation that the Pazzi conspired against them. Julian was murdered while he heard mass April 26th 1478; and Laurence, who was only wounded, was carried back to his house in the midst of the shouts and acclamations of the people. Heir to the greater part of his grandfather's virtues, he was, like him, the Mæcenas of his age. It was equally astonishing (says an historian of that country) and foreign to our manners, to see the same man engaged in commerce, and supporting the burden of the public affairs; conversing with factors, and receiving ambassadors; giving shows to the people; affording an asylum to the unfortunate; and adorning his country with many magnificent buildings. He was so much beloved by the Florentines, that they appointed him chief magistrate of the republic. By his unbounded liberality, he drew to his court a great number of learned men. He sent John Lascaris into Greece to recover manuscripts, with which he enriched his library. He cultivated learning himself, and was the author of the following works: 1. *Des Poesies Italiennes*, Venice, 1554, 12mo. 2. *Canzonne à ballo*, 1568, 4to. 3. *La Compagnia del Mantellaccio Beoni*, with the sonnets of

Medicis. *Burchiello*, 1558 or 1568, 8vo. Laurence de Medicis was so universally admired, that the princes of Europe did him the honour to appeal their differences to his decision. It is even reported, that Bajazet emperor of the Turks, to show him a mark of esteem and regard, caused search for the murderers of his brother Julian in Constantinople, and sent back one of them who had concealed himself in that city. Pope Sixtus IV. was the last of his enemies; but he opposed him with so much ability, that he brought him to terms of accommodation. This illustrious man died April 9th 1492, aged 44. His reputation was sullied by his passion for women and by his infidelity. His two sons, Peter who succeeded him and who was expelled from Florence in 1404, and John who went by the name of Pope Leo X. were like their father remarkable for their generosity and their love of learning Peter died in 1594, leaving Laurence, the last male issue of this branch. Laurence was the father of Catharine de Medicis, who married Henry II. king of France.

Medicis (John de), on account of his bravery and knowledge in military affairs was surnamed the *Invincible*. He was the son of John, otherwise called *Jourdain*, de Medicis. His only son Cosmo I. styled the *Great*, was chosen duke of Florence after the murder of Alexander de Medicis, A. D. 1537. He first carried arms under Laurence de Medicis against the duke of Urbino, afterwards under Pope Leo X. Upon the death of Leo, he entered into the service of Francis I. which he quitted to follow the fortunes of Francis Sforza duke of Milan. When Francis I. formed an alliance with the pope and the Venetians against the emperor, he returned to his service. He was wounded in the knee at Governola, a small town in the Mantuan territory, by a musket-ball; and being carried to Mantua, he died the 29th of November 1526, aged 28. Brantome relates, that when his leg was to be cut off, and when he was informed that he needed some person to support him, "Proceed without fear (said he), I need nobody!" and he held the candle himself during the operation. This anecdote is also mentioned by Varchi. John de Medicis was above the middle stature, strong, and nervous. His soldiers, to express their affection for him and their concern for his loss, assumed a mourning dress and standards, which gave the name of *the black band* to the Tuscan troops whom he commanded.

Medicis, (Laurence, or Laurenein de), was descended from a brother of Cosmo the Great, and affected the name of *popular*. In 1537, he killed Alexander de Medicis, whom Charles V. had made duke of Florence, and who was believed to be the natural son of Laurence de Medicis duke of Urbino. He was jealous of Alexander's power, and disguised this jealousy under the specious pretext of love to his country. He loved men of learning, and cultivated literature. His works are, 1. *Lamenti*, Modena, 12mo. 2. *Aridosio Commedia*, Florence 1595, 12mo. He died without issue.

Medicis, (Hypolitus de), natural son of Julian de Medicis and a lady of Urbino, was early remarkable for the brilliancy of his wit and the graces of his person. Pope Clement VII. his cousin, made him cardinal in 1529, and sent him as legate into Germany to the court of Charles V. When that prince went into Italy, Medicis, yielding to his warlike disposition, appeared in the dress of an officer, and advanced before the emperor, followed by several respectable gentlemen of the court. Charles, naturally suspicious, and afraid that the legate intended to do him some ill offices with the pope, sent after him and caused him to be apprehended. But when he understood that it was a mere sally of humour in the young cardinal, he set him at liberty in a few days. The character which Medicis obtained by the happy success of this appointment, was of essential service to him. He was considered as one of the supports of the Holy See; and a little before Clement's death, when the corsair Barbarossa made a descent into Italy to the great terror of Rome, which was only defended by 200 of the pope's guards, Medicis was dispatched to protect the coasts from the fury of the barbarians. On his arrival at the place of destination, he was fortunate enough to find that Barbarossa had withdrawn himself at that critical moment; which allowed him to claim the honour of the retreat without exposing his person or his army. When he returned to Rome, he was of great service in the election of Paul III. who nevertheless refused to make him legate to Ancona, though that office had been promised to him in the conclave. Enraged also that the pope had bestowed the principality of Florence on Alexander de Medicis, supposed to be the natural son of Laurence duke of Urbino, he was prompted by his ambition to believe that he might succeed to that dignity by the destruction of Alexander. He entered into a conspiracy against him, and determined to carry him off by a mine; but the plot was discovered before he had accomplished his purpose. Octavian Zanga, one of his guards, was arrested as his chief accomplice. Hypolitus de Medicis, apprehensive for his own safety, retired to a castle near Trivoli. On his road to Naples, he fell sick at Itri in the territory of Fondi, and died August 13th 1535, in his 24th year, not without suspicion of being poisoned. His house was an asylum for the unfortunate, and frequently for those who were guilty of the blackest crimes. It was open to men of all nations; and he was frequently addressed in 20 different languages. He had a natural son named *Asdrubal de Medicis*, who was a knight of Malta. This anecdote proves that his manners were more military than ecclesiastic. He wore a sword, and never put on the habit of cardinal except on occasions of public ceremony. He was wholly devoted to the theatre, hunting, and poetry.

Medicis, (Alexander de), first duke of Florence in 1530, was natural son of Laurence de Medicis surnamed the *Younger*, and nephew of pope Clement VII. He owed his elevation to the intrigues of his uncle and to the arms of Charles V. This prince having made himself master of Florence after an obstinate siege, conferred the sovereignty of this city on Alexander, and afterwards gave him in marriage Margaret of Austria his natural daughter. According to the terms of capitulation granted to the Florentines, the new duke was to be only hereditary doge, and his authority was tempered by councils; which left them at least a shadow of their ancient liberty. But Alexander,

Alexander, who felt himfelf fupported by the emperor and the pope, was no fooner in poffeffion of his new dignity, than he began to govern like a tyrant; being guided by no law but his own caprice, indulging the moft brutal paffions, and making light of difhonouring families, and of violating even the afylum of the cloifters to gratify his luft. Among the confidants of his debauchery was a relation of his own, Laurence de Medicis. This young man, who was only 22 years of age, at the inftigation of Philip Strozzi, a zealous republican, conceived the defign of affaffinating Alexander, and thereby of delivering his country from oppreffion. From the moment when he firft became attached to him, he tried to gain his confidence, for no other reafon but that he might the better have it in his power to take away his life. A confiderable time elapfed before he found fuch an opportunity as he defired. At length, under pretence of procuring the duke a *tête à tête* with a lady of whom he was deeply enamoured, he brought him alone and unattended into his chamber, and put him under his bed. He went out, under pretence of introducing the object of his paffion; and returned along with an affaffin by profeffion, to whom alone he had entrufted his defign, only to ftab him. This cruel fcene happened on the night betwixt the 5th and 6th of January 1537. Alexander was only 26 years of age. The Florentines derived no advantage from this crime of Laurence, for they failed in their attempt to recover their liberty. The party of the Medicis prevailed, and Alexander was fucceeded by Cofmo; whofe government, it muft be confeffed, was as juft and moderate, as that of his predeceffor had been violent and tyrannical. Laurence de Medicis fled to Venice, to fome of the leaders of the malcontents at Florence, who had taken refuge there; but not thinking himfelf in fufficient fecurity, he went to Conftantinople, whence he returned fome time after to Venice. He was there affaffinated in 1547, ten years after the duke's murder, by two foldiers, one of whom had formerly been in Alexander's guards: And thefe foldiers were generous enough to refufe a confiderable fum of money, which was the price put upon his head.

Medicis (Cofmo de), grand duke of Tufcany, joined Charles V. againft the French, after trying in vain to continue neutral. As a reward for his fervices, the emperor added to the duchy of Tufcany Piombino the ifle of Elba and other ftates. Cofmo foon after received from pope Pius IV. the title of *grand duke*; and had it not been oppofed by all the princes of Italy, this pontiff, who was entirely devoted to Cofmo, becaufe he had thought proper to acknowledge him to be of his houfe, would have conferred on him the title of *king*. There never was a more zealous patron of learning. Ambitious of imitating the fecond Cæfar, he, like him, was fond of learned men, kept them near his perfon, and founded for them the univerfity of Pifa. He died in 1574, at the age of 55, after governing with equal wifdom and glory. In 1562 he inftituted the military order of St Stephen. His fon, Francis Mary, who died in 1587, was the father of Mary of Medicis the wife of Henry the Great, and of Ferdinand I. who died in 1608.

MEDIETAS linguæ, in law, fignifies a jury, or inqueft impanelled, of which the one half are natives of this land and the other foreigners. This jury is never ufed except where one of the parties in a plea is a ftranger and the other a denizen. In petit-treafon, murder, and felony, foreigners are allowed this privilege; but not in high-treafon, becaufe an alien in that cafe fhall be tried according to the rules of the common law, and not by a *medietas linguæ*. A grand jury ought not in any cafe to be of a *medietas linguæ*; and the perfon that would have the advantage of a trial in this way, is to pray the fame, otherwife it will not be permitted on a challenge of the jurors.

MEDIMNUS, in Grecian antiquity, a meafure of Capacity. See Measure.

MEDINA-talnabi, a famous town of Arabia Petræa, between Arabia Deferta and Arabia the Happy; celebrated for being the burial-place of Mahomet. It ftands at a day's journey from the port of Iambo. It is of moderate fize, furrounded by wretched walls, and fituated in the midft of a fandy plain. It belongs to the Scherif of Mecca, although it had of late times a particular fovereign of the family of Dacii Barkad. At prefent, the government is confided by the Scherif to a vizir, who muft be taken from the family of the fovereign. Before Mahomet, this city was called *Iathreb*; but it got the name of *Medinet en Nebbi*, "the City of the Prophet," after Mahomet, being driven from Mecca by the Koreifchites, had taken refuge there, and paffed in it the reft of his days. The tomb of Mahomet at Medina is refpected by Muffulmans, but they are under no obligation to vifit it for the purpofes of devotion. The caravans of Syria and Egypt alone, which on their return from Mecca pafs near Medina, go a little out of their way to fee the tomb. It ftands in a corner of the great fquare, whereas the Kaba is fituated in the middle of that at Mecca. That the people may not perform fome fuperftitious worfhip to the relics of the prophet, they are prevented from approaching the tomb by grates, through which they may look at it. It confifts of a piece of plain mafon-work in the form of a cheft, without any other monument. The tomb is placed between two others, where the afhes of the two firft caliphs repofe. Although it is not more magnificent than the tombs of the greater part of the founders of mofques, the building that covers it is decorated with a piece of green filk ftuff embroidered with gold, which the pacha of Damafcus renews every feven years. It is guarded by 40 eunuchs, who watch the treafure faid to be depofited there. It is feated in a plain abounding with palm-trees, in E. Long. 39. 53. N. Lat. 25. See (*Hiftory of*) *Arabia*.

Medina-Celi, an ancient town of Spain, in Old Caftile, and capital of a confiderable duchy of the fame name; feated near the river Xalon, in W. Long. 2. 9. N. Lat. 41. 15.

Medina-de-las-Torres, a very ancient town of Spain, in Eftramadura, with an old caftle, and the title of a duchy. It is feated on the confines of Andalufia, at the foot of a mountain near Bajadoz.

Medina-del-Campo, a large rich, and ancient town of Spain, in the kingdom of Leon. The great fquare is very fine, and adorned with a fuperb fountain. It is is a trading place, enjoys great privileges, and is feated in a country abounding with corn and wine. W. Long. 4. 20. Nat. Lat. 41. 22.

Medina-del-rio-Secco, an ancient and rich town of Spain, in the kingdom of Leon, with the title of a duchy: feated on a plain, where there are fine paftures. E. Long. 4 33. N. Lat. 42. 8.

MEDINA (Sir John), a very eminent painter, was fon of Medina de L'Afturias, a Spanifh captain who had fettled at Bruffels, where the fon was born in 1660. He was inftructed in painting by du Chatel; under whofe direction he made good progrefs; and applying himfelf to the ftudy of Rubens, made that eminent mafter his principal model. He painted both hiftory and portrait; and was held in extraordinary efteem by moft of the princes of Germany, who diftinguifhed his merit by feveral marks of honour. He married young, and came into England in 1686, where he drew portraits for feveral years with great reputation; as he painted thofe fubjects with remarkable freedom of touch, a delicate management of tints, and ftrong refemblance of the perfons. The earl of Leven encouraged him to go to Scotland, and procured him a fubfcription of 500 l. worth of bufinefs. He went, carrying a large number of bodies and poftures, to which he painted heads. He returned to England for a fhort time; but went back to Scotland, where he died, and was buried in the church-yard of the Greyfriers at Edinburgh in 1711, aged 52. He painted moft of the Scotch nobility; but was not rich, having 20 children. The portraits of the profeffors in the furgeon's-hall at Edinburgh were painted by him, and are commended. At Wentworth-caftle is a large piece containing the firft duke of Argyle and his fons, the two late dukes John and Archibald, in Roman habits; the ftyle Italian, and fuperior to moft modern performers. In furgeon's-hall are two fmall hiftories by him. The duke of Gordon prefented Sir John Medina's head to the great duke of Tufcany for his collection of portraits done by the painters themfelves; the duke of Gordon too was drawn by him, with his fon the marquis of Huntley and his daughter Lady Jane, in one piece. Medina was knighted by the duke of Queenfberry, lord high commiffioner; and was the laft knight made in Scotland before the union. The prints in the octavo edition of Milton were defigned by him; and he compofed another fet for Ovid's Metamorphofis, but they were never engraved.

MEDINE, an Egyptian piece of money, of iron filvered over, and about the fize of a filver threepence.

MEDIOLANUM, an ancient city, the capital of the Infubres, built by the Gauls on their fettlement in that part of Italy. A *municipium*, and a place of great ftrength. The feat of the liberal arts; whence it had the name of *Novæ Athenæ*. Now *Milan*, capital of the Milanefe, fituated on the rivers Olana and Lombro, E. Long. 9. 30. N. Lat. 45. 25.

Mediolanum Aulercorum (anc. geog.), a town of Gallia Celtica, which afterwards took the name of the *Eburovicum Civitas* (Antonine); corrupted to *Civitas Ebroicorum*, and this laft to *Ebroica*; whence the modern appellation *Evreux*, a city of Normandy. E. Long. 1. 12. N. Lat. 49. 21.

Mediolanum Gugernorum (anc. geog.), a town of Gallia Belgica; now the village *Moyland*, not far from Cologne.

Mediolanum Ordovicum (anc. geog.), a town of Britain, now *Llan Vethlin*, a market-town in Montgomeryfhire in Wales.

Mediolanum Santonum (anc. geog.), which afterwards taking the name of the people, was called *Santonica Urbs*; alfo *Santones* and *Santoni*: A town of Aquitain. Now *Saintes*, capital of Saintonge in Guienne, on the river Charente.

MEDIOMATRICI, anciently a territory of Belgica. Now the diocefe of Metz.

MEDITATION, an act by which we confider any thing clofely, or wherein the foul is employed in the fearch or confideration of any truth. In our religion, it is ufed to fignify a confideration of the objects and grand truths of the Chriftian faith.

Myftic divines make a great difference between *meditation* and *contemplation*: the former confifts in difcurfive acts of the foul, confidering methodically and with attention the myfteries of faith and the precepts of morality; and is performed by reflections and reafonings, which leave behind them manifeft impreffions on the brain. The pure contemplative have no need of meditation, as feeing all things in God at a glance, and without any reflection. When a man, therefore, has once quitted meditation, and is arrived at contemplation, he returns no more; and, according to Alvarez, never refumes the oar of meditation, except when the wind of contemplation is too weak to fill his fails.

MEDITERRANEAN, fomething inclofed within land; or that is remote from the ocean.

Mediterranean is more particularly ufed to fignify that large fea which flows between the continents of Europe and Africa, entering by the ftraits of Gibraltar, and reaching into Afia, as far as the Euxine Sea and the Palus Mæotis.

The Mediterranean was anciently called the *Grecian Sea* and the *Great Sea*. It is now cantoned out into feveral divifions, which bear feveral names. To the weft of Italy it is called the *Liguftic* or *Tufcan Sea*; near Venice, the *Adriatic*; towards Greece, the *Ionic* and *Ægean*; between the Hellefpont and the Bofphorus, the *White Sea*, as being very fafe; and beyond, the *Black Sea*, its navigation being dangerous.

The Britifh trade carried on by means of the Mediterranean Sea is of the laft confequence to Great Britain; and the permanent prefervation thereof depends on the poffeffion of the town and fortification of Gibraltar.

The counterfeiting of Mediterranean paffes for fhips to the coaft of Barbary, &c. or the feal of the admiralty office to fuch paffes, is felony without benefit of clergy. Stat. 4 Geo. II. c. 18.

MEDITRINALIA, a Roman feftival in honour of the goddefs Meditrina, kept on the 30th of September. Both the deity and the feftival were fo called a *medendo*, becaufe on this day they began to drink new wine mixed with old by way of medicine. The mixture of wines, on this feftival, was drank with much form and folemn ceremony.

MEDITULLIUM, is ufed by anatomifts for that

Medium || Meduſa.

ſpungy ſubſtance between the two plates of the *cranium*, and in the interſtices of all laminated bones See Anatomy, n° 1, 11.

MEDIUM, in logic, the mean or middle term of a ſyllogiſm, being an argument, reaſon, or conſideration, for which we affirm or deny any thing; or, it is the cauſe why the greater extreme is affirmed or denied of the leſs in the concluſion.

Medium, in arithmetic, or *arithmetical medium* or *mean*, called in the ſchools *medium rei;* that which is equally diſtant from each extreme, or which exceeds the leſſer extreme as much as it is exceeded by the greater, in reſpect of quantity, not of proportion; thus 9 is a medium betwixt 6 and 12.

Geometrical Medium, called in the ſchools *medium perſonæ*, is that where the ſame ratio is preſerved between the firſt and ſecond as between the ſecond and third terms; or that which exceeds in the ſame ratio or quota of itſelf, as it is exceeded: thus 6 is a geometrical medium between 4 and 9.

Medium, in philoſophy, that ſpace or region thro' which a body in motion paſſes to any point: thus æther is ſuppoſed to be the medium through which the heavenly bodies move; air, the medium wherein bodies move near our earth; water, the medium wherein fiſhes live and move; and glaſs is alſo a medium of light, as it affords it a free paſſage. That denſity or conſiſtency in the parts of the medium, whereby the motion of bodies in it is retarded, is called the *reſiſtance of the medium;* which, together with the force of gravity, is the cauſe of the ceſſation of the motion of projectiles.

Subtile or *Ætherial Medium*. Sir Iſaac Newton conſiders it probable, that, beſide the particular aereal medium, wherein we live and breathe, there is another more univerſal one, which he calls an *ætherial medium;* vaſtly more rare, ſubtile, elaſtic, and active, than air; and by that means freely permeating the pores and interſtices of all other mediums, and diffuſing itſelf through the whole creation; and by the intervention hereof he thinks it is that moſt of the great phenomena of nature are effected. See Æther, Electricity, Fire, &c.

Medium, in optics, any ſubſtance through which light is tranſmitted.

MEDLAR, in botany. See Mespilus.

MEDULLA ossium, or *Marrow of the Bones*. See Anatomy, n° 5.

Medulla cerebri and *cerebelli*, denotes the white ſoft part of the brain and cerebellum, covered on the outſide with the cortical ſubſtance, which is of a more dark or aſhy colour. See Anatomy, n° 131—133.

Medulla oblongata, is the medullary part of the brain and cerebellum, joined in one; the fore-part of it coming from the brain, and the hind-part from the cerebellum. See Anatomy, n° 134.

It lies on the baſis of the ſkull, and is continued thro' the great perforation thereof into the hollow of the vertebræ of the neck, back, and loins; though only ſo much of it retains the name *oblongata* as is included within the ſkull. After its exit thence, it is diſtinguiſhed by the name of *medulla ſpinalis*. *Ibid.* n° 135.

MEDUSA (fab. hiſt.), one of the three Gorgons, daughter of Phorcys and Ceto. She was the only one of the Gorgons who was ſubject to mortality. She is celebrated for her perſonal charms and the beauty of her locks. Neptune became enamoured of her, and obtained her favours in the temple of Minerva. This violation of the ſanctity of the temple provoked Minerva; and ſhe changed the beautiful locks of Meduſa, which had inſpired Neptune's love, into ſerpents, the ſight of which turned the beholders into ſtones: but Perſeus, armed with Mercury's ax with which he killed Argus, cut off Meduſa's head, from whoſe blood ſprang Pegaſus and Chryſaor, together with the innumerable ſerpents that infeſt Africa. The conqueror placed Meduſa's head on the ægis of Minerva, which he had uſed in his expedition; and the head ſtill retained the ſame petrifying powers as before.

Meduſa.

Medusa, in zoology, a genus of vermes, belonging to the order of molluſca. The body is gelatinous, roundiſh, and depreſſed; and the mouth is in the centre of the under part of the body. Many ſpecies, on being handled, affect with a nettle-like burning, and excite a redneſs. The ancients, and ſome of the moderns, add that they have an aphrodiſiac property, and in ſeveral languages they are called by an obſcene name. They were known to the Greeks and Romans by the names of Πνευμα Θαλασσιος, and *pulmo marinus*, or ſea-lungs. They attributed medicinal virtues to them. Dioſcorides informs us, that, if rubbed freſh on the diſeaſed part, they cured the gout in the feet, and kibed heels. Ælian ſays, that they were depilatory; and, if macerated in vinegar, would take away the beard. Their phoſphoric quality is well known; nor was it overlooked by the ancients. Pliny obſerves, that if rubbed with a ſtick it will appear to burn, and the wood to ſhine all over. The ſame naturaliſt obſerves, that when they ſink to the bottom of the ſea, they portend a continuance of bad weather.

On Plate CCXCIV, are figured ſeveral ſpecimens, viz. 1. The aurita, or aurited meduſa; which appears, as floating on the water, to be a mere lifeleſs lump of Fig. 3. n° 1.
jelly. It is of a whitiſh colour, with a caſt of bluiſh grey, and is of an orbiculated figure, elevated into a convexity in the middle on the upper ſide, flat on the under, and furniſhed with a fringe of fine and ſomewhat rigid filaments round the edge, reſembling white hairs: on the under ſurface there are four cavities near the centre, each of an arcuated figure, and ſurrounded with an opaque line, formed of about 24 parallel points or dots: from the very centre of the under ſide there ariſe four crooked appendages, which have each a row of hairy filaments on the exterior edge; and on the upper ſurface there is an appearance of fine veſſels of a pale colour. This ſpecies is frequent, floating on the ſurface of the ſea, or adhering to rocks about our own coaſts; and when the ſun ſhines on them, they have a very beautiful lucid appearance. It is called by ſome the *ſea nettle*, it being one of thoſe animals that when touched occaſions a very diſagreeable tingling in the hands. 2. The capillata, or capillated meduſa, is a very Ibid 3 n° 2.
ſingular and odd animal: it ſeems a mere lump of a whitiſh ſemi-pellucid jelly; and is as eaſily broken and deſtroyed by a touch as the common jellies brought to our tables: its ſhape is rounded, riſing into a convexity in the middle, where it is therefore thickeſt, and whence it becomes gradually thinner to the ſides: on the under ſide it is plain, and on this there is viſible a rough, or as it were echinated circle, within which

there run eight pairs of rays from the centre toward the circumference; and from the centre there arise also a number of curled appendages, which are sometimes reddish, but more usually whitish, and a vast number of slender filaments: the edge or the circumference of the body is regularly divided into eight portions, and each of them is emarginated, so that on the whole verge there are 16 sinuses. This species is to be met with in vast abundance floating on the surface of the water about Sheppey island in Kent, and elsewhere on that coast: great quantities of it are destroyed by being thrown on shore with the waves, whence it has no power of getting off again; and in the open seas, many fish skim near the surface, and prey on them. This is the species called by many authors *pulmo marinus*, or the sea lungs. 3. The marsupialis, or purse medusa, is semi-oval, with four tentacula on the edge. It inhabits the Mediterranean.

Fig. 3. n° 3.

Ibid. n° 4.

4. The waved medusa has the edges waved, with fangs on the projecting parts; four orifices beneath, between which rises a stem divided into eight large ragged tentacula.

These animals swim in large companies in search of food, with their tentacula in continual motion, with which they seize their prey, and convey it to their mouths: they vary in size, the largest being generally about eight inches in diameter. They vary likewise in the number of their tentacula; some having only two, others four, six, and some eight, but they rarely exceed that number. So powerful is their embrace, that whatever prey comes within their reach never escapes. They subsist on insects, small fish, &c.

Mr Banks, in his passage from Madeira to Rio de Janeiro, discovered a new species, which, when brought aboard by the casting net, had the appearance of metal violently heated, and emitted a white light. With these animals were taken small crabs of three different species, altogether new, each of which gave as much light as the glow-worm, though the creature was not so large by nine-tenths. These luminous animals are one of the causes of that appearance to the sea which has been mentioned by many navigators, and of which various reasons have been assigned. It appeared to emit flashes of light exactly resembling those of lightning, only not so considerable, but so frequent, that sometimes eight or ten were visible at the same moment.

MEDWAY, a river of England, rises in the Weald of Sussex, and entering Kent near Ashurst, runs by Tunbridge, and thence continues its course towards Maidstone. It is navigable for large ships to Rochester bridge, and thence for vessels and barges to Maidstone, the tide flowing up to that town. The distance between the mouth of this river, where the fort at Sheerness is erected, and Rochester bridge, is between 16 and 18 miles. In this part of the river, the channel is so deep, the banks so soft, and the reaches so short, that it is one of the best and safest harbours in the world; and ships of 80 guns ride a-float at low-water, within musket-shot of Rochester-bridge. Nor is there a single instance upon record, that any of the royal navy ever suffered here by storms, except in that dreadful tempest which happened in November 1703, when the Royal Catharine was driven on shore, where she sunk and was lost. On the shore of this river are two castles, one at Upnor, which guards two reaches of the river, and is supposed to defend all the ships which ride above, between that and the bridge; on the other side of the river is Gillingham castle, built for the same purpose, and well furnished with cannon which commands the river. Besides these, there is a platform of guns at a place called the Swam, and another at Cockham-wood. But the principal fortification on this river is the castle at Sheerness.

MEEREN, or Meer, (John Vander,) called the *Old*, an esteemed painter, was born in 1627; but the master, under whom he learned the art of painting, is not mentioned. His genius directed him to choose for his subjects sea-pieces, landscapes, and views of the sea and its shores; which he painted with great truth, as he had accustomed himself to sketch every scene after nature. The situations of his landscapes are agreeably chosen, frequently they are solemn, and generally pleasing. The forms of his trees are easy and natural, his distances well observed, and the whole scenery has a striking effect, by a happy opposition of his lights and shadows. He also very often painted battles in such a style as met with approbation; as they showed good composition, were touched with spirit, and had a great deal of transparence in the colouring. But the fault imputable to Vander Meer is, that in some of his pictures the back-grounds are a little too blue, and that some of his landscapes have a tint which appears rather too yellowish. He died in 1690.

Meeren, or *Meer*, (John Vander), called *De Jonghe*, an eminent landscape-painter, is supposed to have been the son of the old John Vander Meer, and of whom he learned the first rudiments of the art; but being in his youth deprived of his instructor before he had made any great progress, he became a disciple of Nicholas Berghem, and was accounted the best of those who were educated in the school of that admired master. In the manner of his master, he painted landscapes and cattle; and his usual subjects are cottages, with peasants at their rural occupations and diversions. It is observed of him, that he very rarely introduced cows, horses, or any other species of animals, except goats and sheep; the latter of which are so highly finished, that one would imagine the wool might be felt by the softness of its appearance. His touch is scarce perceptible, and yet the colours are admirably united. He died in 1688. The genuine works of this Vander Meer bear a very high price, and are esteemed even in Italy, where they are admitted into the best collections; but the scarcity of them has occasioned many moderate copies after his works to be passed on the undiscerning for real originals.

MEGALE polis, (anc. geog.) dividedly (Ptolemy, Pausanius); or conjunctly *Megalopolis*, (Strabo): A town of Arcadia, built under the auspices of Epaminondas, after the battle of Leuctra; many inconsiderable towns being joined together in one great city, the better to withstand the Spartans. It was the greatest city of Arcadia, according to Strabo.

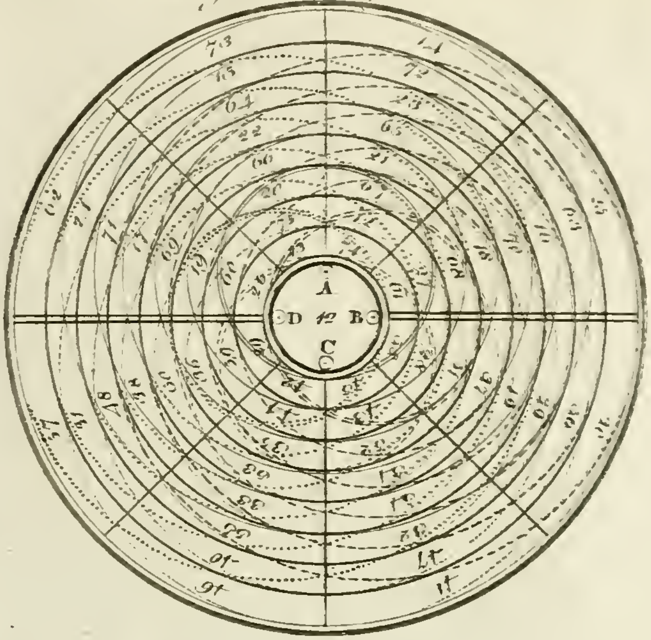
MAGALESIA, and Megalenses Ludi, feasts and games in honour of Cybele or Rhea the mother of the gods, kept on the 12th of April by the Romans, and famous for great rejoicings and diversions of various sorts. The Galli carried the image of the goddess along the city, with sound of drums and other music,

Plate CCXCIV.

Magic Square of Squares.

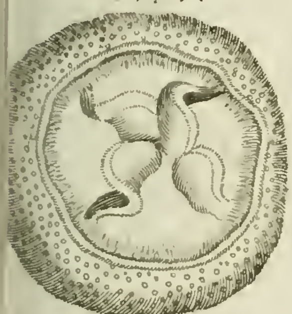
200	217	232	249	8	25	40	57	72	89	104	121	136	153	168	181
58	39	26	7	250	231	218	199	186	167	154	135	122	103	90	71
198	219	230	251	6	27	38	59	70	91	102	123	134	155	166	187
60	37	28	5	252	229	220	197	188	165	156	133	124	101	92	69
201	216	233	248	9	24	41	56	73	88	105	120	137	152	169	184
55	42	23	10	247	234	215	202	183	170	151	138	119	106	87	74
203	214	235	246	11	22	43	54	75	86	107	118	139	150	171	182
53	44	21	12	245	236	213	204	181	172	149	140	117	108	85	76
205	212	237	244	13	20	45	52	77	84	109	116	141	148	173	180
51	46	19	14	243	238	211	206	179	174	147	142	115	110	83	78
207	210	239	242	15	18	47	50	79	82	111	114	143	146	175	178
49	48	17	16	241	240	209	208	177	176	145	144	113	112	81	80
196	221	228	253	4	29	36	61	68	93	100	125	132	157	164	189
62	35	30	3	254	227	222	195	190	163	158	131	126	99	94	67
194	223	226	255	2	31	34	63	66	95	98	127	130	159	162	191
64	33	32	1	256	225	224	193	192	161	160	129	128	97	96	65

Magic Circle of Circles.



Medusa

N.° 1.



N.° 2.

N.° 3.

N.° 4.

Meloe.

Merops, A.

Merops, B.

Mergus cucullatus.

music, in imitation of the noise they made to prevent Saturn from hearing the cries of his infant son Jupiter, when he was disposed to devour him.

MEGARA (anc. geog.), a noble city, and the capital of the territory of Megaris, which for many years carried on war with the Corinthians and Athenians. It had for some time a school of philosophers, called the *Megarici*, successors of Euclid the Socratic, a native of Megara. Their dialect was the Doric; changed from the Attic, which it formerly had been, because of Peleponnesian colonists who settled there.

Megara was situated at a distance from the sea. Its port was called *Nisæa*, from Nisus son of Pandion the second, who obtained the Megaris for his portion, when the kingdom of Athens was divided into four lots by his father. He founded the town, which was eighteen stadia or two miles and a quarter from the city, but united with it, as the Piræus with Athens, by long walls. It had a temple of Ceres. "The roof (says Pausanias) may be supposed to have fallen through age." The site (as Dr Chandler informs us †) is now covered with rubbish, among which are standing some ruinous churches. The place has been named from them *Dode Ecclesiais*, "The Twelve Churches;" but the number is reduced to seven. The acropolis or citadel, called also *Nisæa*, was on a rock by the sea-side. Some pieces of the wall remain, and a modern fortress has been erected on it, and also on a lesser rock near it.

† Travels in Greece, 192.

The village Megara (continues the Doctor) consists of low mean cottages, pleasantly situated on the slope of a brow or eminence indented in the middle. On each side of this vale was an acropolis or citadel; one named Caria; the other from Alcathous, the builder of the wall. They related, that he was assisted by Apollo, who laid his harp aside on a stone, which, as Pausanias testifies, if struck with a pebble returned a musical sound. An angle of the wall of one citadel is seen by a wind-mill. The masonry is of the species called Incertum. In 1676 the city-wall was not entirely demolished, but comprehended the two summits, on which are some churches, with a portion of the plain toward the south. The whole site, except the hills, was now green with corn, and marked by many heaps of stones, the collected rubbish of buildings. A few inscriptions are found, with pedestals fixed in the walls and inverted; and also some maimed or mutilated statues. One of the former relates to Atticus Herodes, and is on a pedestal which supported a statue erected to him when consul, A. D. 143. by the council and people of Megara, in return for his benefactions and good-will toward the city. In the plain behind the summits, on one of which was a temple of Minerva, is a large basin of water, with scattered fragments of marble, the remains of a bath or of a fountain, which is recorded as in the city, and remarkable for its size and ornaments, and for the number of its columns. The spring was named from the local nymphs called Sithnides.

The stone of Megara was of a kind not discovered any where else in Hellas; very white, uncommonly soft, and consisting entirely of cockle-shells. This was chiefly used; and, not being durable, may be reckoned among the causes of the desolation at Megara, which is so complete, that one searches in vain for vestiges of the many public edifices, temples, and sepulchres, which once adorned the city.

Megara was engaged in various wars with Athens and Corinth, and experienced many vicissitudes of fortune. It was the only one of the Greek cities which did not re-flourish under their common benefactor Hadrian; and the reason assigned is, that the avenging anger of the gods pursued the people for their impiety in killing Anthemocritus, a herald, who had been sent to them in the time of Pericles. The Athenian generals were sworn on his account to invade them twice a-year. Hadrian and Atticus were followed by another friend, whose memory is preserved by an inscription on a stone lying near a church in the village:— "This too is the work of the most magnificent count Diogenes son of Archelaus, who regarding the Grecian cities as his own family, has bestowed on that of the Megarensians one hundred pieces of gold toward the building of their towers, and also one hundred and fifty more with two thousand two hundred feet of marble toward re-edifying the bath; deeming nothing more honourable than to do good to the Greeks, and to restore their cities." This person is not quite unnoticed in history. He was one of the generals employed by the emperor Anastasius on a rebellion in Isauria. He surprised the capital Claudiopolis, and sustained a siege with great bravery, A. D. 494.

Megara retains its original name. It has been much infested by corsairs; and in 1676 the inhabitants were accustomed, on seeing a boat approach in the day time or hearing their dogs bark at night, immediately to secrete their effects and run away. The Vaiwode or Turkish governor, who resided in a forsaken tower above the village, was once carried off. It is no wonder, therefore, that Nisæa has been long abandoned. The place was burned by the Venetians in 1687.

MEGARA (anc. geog.) formerly called *Hybla*, a town towards the east coast of Sicily; extinct in Strabo's time, though the name Hybla remained on account of the excellence of its honey. It was a colony of Megareans from Greece. *Risus Megaricus* denotes a hoarse-laugh.

MEGARIS (anc. geog.), the country of the Megareans, is described as a rough region, like Attica; the mountain called *Oneian* or the Asinine, now *Macriplayi* or "the long Mountain," extending through it toward Bœotia and mount Cithæron. It belonged to Ionia or Attica, until it was taken by the Peloponnesians in the reign of Codrus, when a colony of Dorians settled in it. This territory had Attica to the east, Bœotia to the north and west, and the Isthmus of Corinth to the south.

MEGARIS, a small island in the Tuscan sea, joined to Naples by a bridge. Now called *Castello dell'Ovo*.

MEGASTHENES, a Greek historian in the age of Seleucus Nicanor, about 300 years before Christ. He wrote about the oriental nations, and particularly the Indians. His history is often quoted by the ancients. What now passes as his composition is spurious.

MEGIDDO (anc. geog.), a town of Galilee, recited (Joshua xvii. 11.) among the cities of Manasseh, in the tribe of Issachar or Asser, on the west side of Jordan. Famous for the defeat of Ahaziah and Josiah, who perished there (2 Kings xxiii. 29.): near it was an an open plain, fit for drawing up an army in battle array. It was situated to the north, contrary to its position in the common maps. The Canaanites, being tributary to the Israelites, dwelt in it, Joshua xvii. — It was rebuilt by Solomon, 1 Kings ix.

MEIBOMIUS, the name of several learned Germans.—*John Henry Meibomius* was professor of physic at Helmstadt, where he was born, and at Lubec; he wrote the *Life of Mæcenas*, published at Leyden in 4to, 1653, with several other learned works. *Henry*, his son, was born at Lubec in 1638; became professor of physic at Helmstadt; and, besides works in his own profession, published *Scriptores rerum Germanicarum*, 3 vol. folio, 1688; a very useful collection, first begun by his father.—*Marcus Meibomius*, of the same family, published a collection of seven Greek authors who had written upon ancient music, with a Latin version by himself; dedicated to Queen Christina of Sweden, who invited him to her court. But she engaging him one day to sing an air of ancient music, while somebody was ordered to dance to it, the immoderate mirth which this occasioned in the spectators so disgusted him, that he immediately left the court of Sweden. His edition of the Greek mythologists, and notes upon Diogenes Laertius in Menage's edition, show him to have been a man of learning; but he suffered no little raillery for his attempt to correct the Hebrew text of the Bible, by a kind of metre he fancied he had found out in those ancient writings.

MEISSEN, a considerable town of Germany, in the electorate of Saxony, and in the margravate of Misnia, with a castle. It formerly belonged to the bishop, but is now secularized, and the inhabitants are Lutherans. In this place is a famous manufactory of porcelain. E. Long. 13. 33. N. Lat. 51. 15.

MEL, HONEY, in the materia medica. See HONEY.

MELA (Pomponius), an ancient Latin writer, was born in the province of Bætica in Spain, and flourished in the reign of the emperor Claudius. His three books of Cosmography, or *De situ orbis*, are written in a concise, perspicuous, and elegant manner; and have been thought worthy of the attention and labours of the ablest critics. Isaac Vossius gave an edition of them in 1658, 4to, with very large and copious notes. To this edition is added, *Julii Honorii oratoris excerptum cosmographiæ*, first published from the manuscript, and *Æthici cosmographia*. Gronovius afterwards published another edition with illustrations by medals. In his last edition are added five books, *De Geographia*, written by some later author; by Jornandes, as Fabricius conjectures.

MELÆNE, or BLACK FLUX, in medicine. See MEDICINE, n° 409.

MELALEUCA, in botany; a genus of the polyandria order, belonging to the polydelphia class of plants. The calyx is quinquepartite, superior; the corolla pentapetalous; the filaments are very numerous, and collected in such a manner as to form five pencils; there is one style; the capsule is half-covered with the calyx, formed like a berry, and is trivalved and trilocular.—This plant has already been noticed under the article (misspelt) MALALEUCA; where also, by mistake, it was said that there is only one species. —The species are five, natives of India and the South Sea islands. The most remarkable species is the LEUCADENDRON, from a variety of which (the *latifolia*, or broad-leaved leucadendron) the Cajeput oil is obtained: a medicine in very high esteem among the eastern nations, particularly in India. It is said to be obtained by distillation from the fruit of the tree. When brought into this country, it is a liquid of a greenish colour, of a fragrant but at the same time a very peculiar odour, and of a warm pungent taste. Some authors, however, represent this oil as being, when of the best quality, a white or colourless fluid; and it has been said by the authors of the *Dispensatorium Brunsvicense*, when prepared in Europe from the seeds sent from India, to be entirely of this appearance. Hitherto the oleum cajeput has been but little employed either in Britain or on the continent of Europe; but in India it is used both internally and externally, and is highly extolled for its medical properties. It is applied externally where a warm and peculiar stimulus is requisite; it is employed for restoring vigour after luxations and sprains, and for easing a violent pain in gouty and rheumatic cases, in tooth-ach, and similar affections; but it has been chiefly celebrated as taken internally, and it is particularly said to operate as a very powerful remedy against tympanitic affections.

MELAMPODIUM, a name given to black hellebore. See HELLEBORUS.

MELAMPODIUM, in botany: A genus of the polygamia necessaria order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is paleaceous and conical; the pappus is monophyllous and valve-like; the calyx pentaphyllous.

MELAMPUS (fab. hist.), a celebrated soothsayer and physician of Argos, son of Amythaon and Idomenea or Dorippe. He lived at Pylos in Peloponnesus. His servants once killed two large serpents who had made their nests at the bottom of a large oak; and Melampus paid so much regard to their remains, that he raised a burning pile and burned them upon it. He also took particular care of their young ones, and fed them with milk. Some time after this, the young serpents crept to Melampus as he slept on the grass near the oak; and, as if sensible of the favours of their benefactor, they wantonly played around him, and softly licked his ears. This awoke Melampus, who was astonished at the sudden change which his senses had undergone. He found himself acquainted with the chirping of the birds, and with all their rude notes, as they flew around him. He took advantage of this supernatural gift, and soon made himself perfect in the knowledge of futurity, and Apollo also instructed him in the art of medicine. He had soon after the happiness of curing the daughters of Prœtus, by giving them hellebore, which from that circumstance has been called *melampodium*; and as a reward for his troubles, he married the eldest of these princesses. The tyranny of his uncle Neleus, king of Pylos, obliged him to leave his native country; and Prœtus, to show himself more sensible of his services, gave him part of his kingdom. About this time the personal charms of Pero, the daughter of Neleus, had gained many admirers; but the father promised his daughter only to him who brought into his hands the oxen of Iphiclus. This condition displeased many; but Bias, who was also one of her admirers, Melampyrum ‖ Melancthon.

mirers, engaged his brother Melampus to steal the oxen and deliver them to him. Melampus was caught in the attempt, and imprisoned; and nothing but his services as a soothsayer and physician to Iphiclus would have saved him from death. All this pleaded in the favour of Melampus; but when he had taught the childless Iphiclus how to become a father, he not only obtained his liberty, but also the oxen; and with them he compelled Neleus to give Pero in marriage to Bias. A severe distemper, which had rendered the women of Argos insane, was totally removed by Melampus; and Anaxagoras, who then sat on the throne, rewarded his merit by giving him part of his kingdom, where he established himself, and where his posterity reigned during six successive generations. He received divine honours after death, and temples were raised to his memory.

MELAMPYRUM, COW-WHEAT: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Personatæ*. The calyx is quadrifid; the upper lip of the corolla is compressed, with the edges folded back; the capsule is bilocular and oblique, opening at one side; there are two gibbous seeds. There are four species, all of them natives of Britain, and growing spontaneously among corn-fields. They are excellent food for cattle; and Linnæus tells us, that where they abound the yellowest and best butter is made. Their seeds, when mixed with bread, give it a dusky colour; and, according to some authors, produce a vertigo, and other disorders of the head; but this is denied by Mr Withering, though he allows that they give it a bitter taste.

MELANCHOLY, a kind of delirium attended with gloomy thoughts, heaviness, and sorrow. See MEDICINE, n° 85, 327.

MELANCTHON (Philip), born at Bretten in the Palatinate in 1495, was one of the wisest and most able men of his age among the Reformers, though of a mild temper, and disposed to accommodate rather than to inflame disputes. In his youth he made an admirable progress in learning, and was made Greek professor at Wirtemberg in 1509. Here his lectures upon Homer, and the Greek text of St Paul's Epistle to Titus, drew to him a great number of auditors, and entirely effaced the contempt to which his low stature and mean appearance had exposed him. Melancthon reduced the sciences to systems; and acquired such reputation, that he had sometimes 2500 auditors. He soon entered into an intimate friendship with Luther, who taught divinity in the same university; and in 1519 they went together to Leipsic, to dispute with Eccius. The following years he was continually engaged in various employments; he composed several books; he taught divinity; took several journeys, in order to found colleges and visit churches; and in 1530 drew up a confession of faith, which goes by the name of the *Confession of Augsburg*, because it was presented to the emperor at the diet held in that city. All Europe was convinced, that he was not, like Luther, backward to accommodate the differences between the various sects of Christians. He hated religious disputes, and was drawn into them only through the necessity of the part he was called to act in the world; and therefore would have sacrificed many things to have produced an union among the Protestants. For this reason, Francis I. the French king, wrote to desire him to come and confer with the doctors of the Sorbonne, in order to agree with them about putting an end to all controversies; but though Luther endeavoured to persuade the elector of Saxony to consent to that journey, and though Melancthon himself desired it, that prince, whether he distrusted Melancthon's moderation, or was afraid of quarrelling with the emperor Charles V. would never grant his permission. The king of England also in vain desired to see him. Melancthon, in 1529, assisted at the conferences of Spires. In 1541, he was at the famous conferences at Ratisbon. In 1543, he went to meet the archbishop of Cologn to assist him in introducing the reformation into his diocese; but that project came to nothing: and in 1548, he assisted at seven conferences on the subject of the interim of Charles V. and wrote a censure on that interim, and all the writings presented at these conferences. He was extremely affected at the dissensions raised by Flaccus Illyricus. His last conference with those of the Roman communion was at Worms, in 1557. He died at Wittemburg in 1560, and was interred near Luther. Some days before he died, he wrote upon a piece of paper the reasons which made him look upon death as a happiness; and the chief of them was, that it "delivered him from theological persecutions." Nature had given Melancthon a peaceable temper, which was but ill suited to the time he was to live in. His moderation served only to be his cross. He was like a lamb in the midst of wolves. No body liked his mildness; it looked as if he was lukewarm; and even Luther himself was sometimes angry at it.

Melancthon was a man in whom many good as well as great qualities were wonderfully united. He had great parts, great learning, great sweetness of temper, moderation, contentedness, and the like, which would have made him very happy in any other times but those in which he lived. He never affected dignities, or honours, or riches, but was rather negligent of all these things; too much so in the opinion of some, considering he had a family; and his son-in-law Sabinus, who was of a more ambitious make, was actually at variance with him upon this very article. Learning was infinitely obliged to him on many accounts; on none more than this, that, as already observed, he reduced almost all the sciences which had been taught before in a vague irregular manner, into systems. Considering the distractions of his life, and the infinity of disputes and tumults in which he was engaged, it is astonishing how he could find leisure to write so many books. Their number is prodigious, insomuch that it was thought necessary to publish a chronological catalogue of them in the year 1582. His works indeed are not correct, and he himself owned it: but as he found them useful, he chose rather to print a great number, than to finish only a few; "which however (as Bayle says) was postponing his own glory to the advantage of others." His constitution was very weak, and required great tenderness and management; which made Luther, as hot and zealous as he was, blame him for labouring too earnestly in the vineyard.

MELANIPPIDES, (fab. hist.), a Greek poet about 520 years before Christ. His grandson of the same name flourished about 60 years after at the court of Perdiccas the Second, of Macedonia. Some fragments of their poetry are still extant.

MELANTERIA, in natural history, a very beautiful fossil, of a dense, compact, and regular texture, and of an extremely bright pale yellow, resembling nothing so much as the purest gold. It is remarkably heavy; and is sometimes found in little irregular masses of the bigness of a pigeon's egg, which are broken with a slight blow: but it is usually met with in the form of a fine gold-coloured efflorescence on vitriolic and pyritical bodies; or in loose, shattery, and friable masses of a more dusky yellow; in which latter state it so much resembles a native sulphur, that it is frequently mistaken for one; however, it is not inflammable; but calcines in the fire to a greyish powder, which by burning longer changes to a deep and fine purple.

The Greeks used it externally as a gentle escharotic and a styptic: they made it an ingredient in their ointments for old ulcers, and used to sprinkle the powder of it on fresh wounds in order to stop the hæmorrhagy.

MELASSES. See MOLASSES.

MELASTOMA, the AMERICAN GOOSEBERRY-TREE, in botany: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quinquefid and campanulated; the petals are five, inserted into the calyx; the berry is quinquelocular, and wrapped in the calyx.—There are a great many species, all of them natives of the warm parts of America, and very beautiful on account of the variegation of their leaves. Most of the leaves are of two different colours on their surfaces; the under side being either white, gold-coloured, or russet, and their upper parts of different shades of green; so that they make a fine appearance in the hot-house all the year round. There are but few of these plants in the European gardens; which may perhaps have been occasioned by the difficulty of bringing over growing plants from the West Indies; and the seeds being small when taken out from the pulp of their fruits, rarely succeed. The best way is to have the entire fruits put up in dry sand as soon as they are ripe, and forwarded by the quickest contrivance to England. They should be immediately taken out when they arrive, and the seeds sown in pots of light earth, and plunged into a moderate hot-bed of tanner's bark. When the plants come up, and are fit to be removed, they must each be planted in a small pot, and plunged into the tan-bed; and afterwards treated as other exotic plants.

MELCHA, a small village of Barbary, situated about 30 miles from the city of Tunis, built on the ruins of CARTHAGE, some of which are still visible.

MELCHITES, in church-history, the name given to the Syriac, Egyptian, and other Christians of the Levant. The Melchites, excepting some few points of little or no importance, which relate only to ceremonies and ecclesiastical discipline, are in every respect professed Greeks; but they are governed by a particular patriarch, who resides at Damas, and assumes the title of *patriarch of Antioch*. They celebrate mass in the Arabian language. The religious among the Melchites follow the rule of St Basil, the common rule of all the Greek monks. They have four fine convents distant about a day's journey from Damas, and never go out of the cloister.

MELCHISEDEC, or MELCHIZEDEK, king of Salem, and priest of the Most High The scripture tells us nothing either of his father, or of his mother, or of his genealogy, or of his birth, or of his death. And in this sense he was a figure of Jesus Christ, as St Paul affirms, who is a priest for ever, according to the order of Melchisedec, and not according to the order of Aaron, whose original, life, and death, are known. When Abraham returned from pursuing the four confederate kings, who had defeated the kings of Sodom and Gomorrah, and had taken away Lot Abraham's nephew along with them (Gen xiv. 17, 18, 19, &c.), Melchisedek came to meet Abraham as far as the valley of Shaveh, which was afterwards named the king's valley, presented him with the refreshment of bread and wine (or he offered bread and wine in sacrifice to the Lord, for he was a priest of the most high God), and blessed him. Abraham, being desirous to acknowledge in him the quality of priest of the Lord, offered him the tythes of all he had taken from the enemy. After this time, there is no mention made of the person of Melchisedec; only the Psalmist (cx. 4.) speaking of the Messiah, says, "Thou art a priest for ever after the order of Melchisedec." St Paul, in his epistle to the Hebrews, unfolds the mystery which is concealed in what is said of Melchisedec in the Old Testament. See Heb. v. 6—10. An infinite number of difficulties and scruples have been started upon the subject of Melchisedec.—St Jerom thought that Salem, of which Melchisedec was king, was not Jerusalem, but the city of Salem near Scythopolis, where they still pretended to show the ruins of the palace of this prince. The greatness and extent of these ruins are a sufficient proof of the magnificence of this ancient building. He thinks it was at this city of Salem or Shalem, that Jacob arrived after his passage over Jordan, at his return from Mesopotamia (Gen xxxiii. 18.) Some believe that Salem, where Melchisedec reigned, is the same as Salim spoken of in the gospel of St John, chap. iii 23. From the time of Epiphanes there were names invented for the father and mother of Melchisedec. To his father was given the name of Heraclas or Heracles, and to his mother that of Ashtaroth or Astaria. It is generally agreed on by the learned, that when the apostle says, he was "without father and without mother," no more is meant, than that he is introduced into the history of Abraham without acquainting us who he was, or whence he came, where he lived, or when he died. Nevertheless, some have taken St Paul's word's literally, and contended that he was not of human but divine nature. Origen and Didymus took him to be an angel; and the author of the *Questions upon the Old and New Testament* pretends, that he was the Holy Ghost, who appeared to Abraham in a human form. The Arabic Catena, upon the ninth chapter of Genesis, makes Melchisedec to be descended from Shem by his father, and from Japheth by his mother.

Melchisedec.

mother. Heraclas or Heraclim his father, was, they fay, fon or grandfon of Phaleg, and fon of Heber; and his mother named Salathiel, was daughter of Gomer fon of Japheth. Cedrenus and others derive Melchifedec from an Egyptian ftock. They fay his father was called Sidon or Sida, and was the founder of the city of Sidon the capital of Phœnicia. Suidas fays he was of the curfed race of Canaan; for which reafon the fcripture does not mention his genealogy. The Jews and Samaritans believed Melchifedec to be the fame with the patriarch Shem; which opinion has been followed by a great number of modern writers. M. Jurieu has undertaken to prove that he is the fame as Cham or Ham. It would be endlefs to fet down all the opinions upon this matter: therefore we fhall only add, that Peter Cunæus and Peter du Moulin have afferted, that Melchifedec who appeared to Abraham was the Son of God, and that the patriarch worfhipped him and acknowledged him for the Meffiah.

About the beginning of the third century arofe the herefy of the Melchifedecians, who affirmed that Melchifedec was not a man, but a heavenly power, fuperior to Jefus Chrift: for Melchifedec, they faid, was the interceffor and mediator of the angels, but Jefus Chrift was fo only for men, and his priefthood only a copy of that of Melchifedec, who was the Holy Ghoft.

We fhall only beg leave to add here one opinion more concerning Melchifedec, which is that of the learned Heidegger, who, as the author of the *Hift. Patriar.* thinks, has taken the right method of explaining the accounts of Mofes and the apoftle Paul relating to this extraordinary perfon. He fuppofes a twofold Melchifedec; the one hiftorical, whereof Mofes gives an account in the xivth chapter of Genefis, as that he was king as well as high-prieft of Jerufalem; the other allegorical, whom St Paul defcribes, and this allegorical perfon is Jefus Chrift.

As the hiftory of this prince and prieft is fo little known, it is no wonder, as Selden obferves, that many fabulous accounts have been invented of him; of which the following may fuffice as a fpecimen. Eutychus patriarch of Alexandria relates, that the body of Adam having been embalmed according to his order, was depofited in a cave under a mountain of the children of Seth; but that Adam before his death had commanded that they fhould take away his remains from that place, and tranfport them to the middle of the earth: that Noah, to follow the orders of his anceftors, had preferved the bodies of Adam and all the patriarchs with him in the ark: that finding himfelf near his death, he ordered his fon Shem to take the body of Adam, to furnifh himfelf with bread and wine for his journey, to take with him Melchifedec the fon of Phaleg, and to go to the place in which an angel would fhow them where to bury the firft man: that Noah added this order, "Command Melchifedec to fix his refidence in that place, and to live unmarried all his lifetime, becaufe God has chofen him to do fervice in his prefence; command him, that he build no temple, nor fhed the blood of birds, nor four-footed beafts, or any other animal; and that he offer no other oblations to God but bread and wine." This is the reafon, according to this author, why Melchifedec, when he met Abraham, brought forth only bread and wine.

Melchifedec, Melcomb-regis.

A Greek author, under the name of Athanafius, relates, that Melchifedec was the fon of an idolatrous king called Melchi and of a queen called Salem.—Melchi, having refolved to offer a facrifice to the gods, fent his fon Melchifedec to fetch him feven calves. In the way the young prince was enlightened by God, and immediately returned to his father, to demonftrate to him the vanity of his idols. Melchi, in wrath, fent him back to fetch the victims. While he was abfent, the king facrificed his eldeft fon, and a great many other children, to his gods. Melchifedec returning, and conceiving great horror at this butchery, retired to mount Tabor, where he lived feven years, without clothes, and fed only on wild fruits. At the end of feven years, God appeared to Abraham, bid him go up to mount Tabor, where he fhould find Melchifedec. He ordered him to cloath him, and to afk his bleffing; which Abraham having done, Melchifedec anointed him with oil, and they came down together from the mountain.

MELCOMB-REGIS, a town of Dorfetfhire, in England, 130 miles from London, is fituated at the mouth of the river Wey, by which it is parted from Weymouth. It appears from the name to have been anciently the king's demefne, and from the records to have paid quit-rent to the crown all along after king Edward I. till it was bought off by the inhabitants before they were united to Weymouth. It lies on the north fide of the haven, on a peninfula furrounded by the fea on all fides except on the north. The ftreets are broad and well paved, and many of the houfes large and high. It fent members to parliament in the reign of king Edward I. before Weymouth had that privilege. It was by parliament appointed a ftaple in the reign of Edward III. In the next reign the French burnt it; and it was thereby rendered fo defolate, that the remaining inhabitants prayed and obtained a difcharge from cuftoms. On account of its quarrels with Weymouth, in the reign of Henry VI. its privileges as a port were removed to Pool: but in that of queen Elizabeth they were reftored to it by act of parliament, which was confirmed in the next reign, on condition that Melcomb and Weymouth fhould make but one corporation, and enjoy their privileges in common; and to this was owing the flourifhing ftate of both. In the two reigns laft mentioned, a wooden bridge with feventeen arches was built from hence to Weymouth; to which, as well as its church, the chief contributors were certain citizens of London; and upon its decay it was rebuilt in 1770. Here is a good market-place and town-hall, to which the members of the corporation of Weymouth come to attend public bufinefs, as the inhabitants do to its church for public worfhip. For feveral years paft the fea has retired from it on the eaft, the priory formerly being bounded by the fea; but there is now a ftreet beyond it, from which it is feveral paces to the high-water mark. The priory was fituated in the eaft part of the town, in Maiden-ftreet, whofe fite occupied about an acre, now covered with tenements. On the fouth fide are the remains of the chapel, now converted into a malt-houfe. Near it are the remains of an ancient building, formerly a nunnery. Here are three meeting-houses and a work-house for the poor. The church, which is in the middle of the town, has a wooden turret for a bell, and had been an old chapel. It was rebuilt in 1605, and made parochial, and is a handsome fabric, with a beautiful altar-piece painted and given by Sir James Thornhill. The port, which generally goes by the name of Weymouth, is said to be the best frequented in the county, and is defended by Sandford and Portland castles. The markets for both towns are Tuesdays and Fridays, but there are no fairs. Melcomb-regis is reckoned bigger, more thriving, and populous than Weymouth. They are both but one corporation and borough, consisting of a mayor, recorder, two bailiffs, an uncertain number of aldermen, and twenty-four capital burgesses. Whoever has been a mayor is ever after an alderman. They send four burgesses to parliament, who are elected by such as have freeholds, whether they inhabit here or not; and the number of voters is near 700. Every elector, as in London, has the privilege of voting for four persons, who when chosen are returned, in two distinct indentures, as the burgesses of Weymouth and the burgesses of Melcomb-Regis.

MELDÆ (anc. geog.), a town of Gallia Celtica, (called *Meldorum Civitas* in the Notitia), on the Matrona. Now *Meaux*, a city in Champaign on the Marne.

MELEAGER (fab. hist.) a celebrated hero, son of Œneus king of Calydonia, by Althæa daughter of Thestius. The Parcæ were present at the moment of his birth, and predicted his future greatness. Clotho said that he would be brave and courageous; Lachesis foretold his uncommon strength and valour; and Atropos said that he should live as long as that firebrand which was on the fire remained entire and unconsumed. Althæa no sooner heard this, than she snatched the stick from the fire, and kept it with the most jealous care, as the life of her son totally depended upon its preservation. The fame of Meleager increased with his years; he signalized himself in the Argonautic expedition, and afterwards delivered his country from the neighbouring inhabitants, who made war against his father at the instigation of Diana, whose altars Œneus had neglected. But Diana punished the negligence of Œneus by a greater calamity. She sent a huge wild boar, which laid waste all the country, and seemed invincible on account of its immense size. It became soon a public concern: all the neighbouring princes assembled to destroy this terrible animal; and nothing is more famous in mythological history, than the hunting of the Calydonian boar. The princes and chiefs that assembled, and which are mentioned by mythologists, were Meleager son of Œneus, Idas and Lynceus sons of Apharcus, Dryas son of Mars, Castor and Pollux sons of Jupiter and Leda, Pirithous son of Ixion, Theseus son of Ægeus, Anceus and Cepheus sons of Lycurgus, Admetus son of Pheres, Jason son of Æson, Peleus and Telamon sons of Æacus, Iphicles son of Amphitryon, Eurytrion son of Actor, Atalanta daughter of Schœneus, Iolas the friend of Hercules, the sons of Thestius, Amphiaraus son of Oileus, Protheus, Cometes, the brothers of Altæa, Hippothous son of Cercyon, Leucippus, Adrastus, Ceneus, Phileus, Echion, Lelex, Phœnix son of Amyntor, Panopeus, Hyleus, Hippasus, Nestor, Menœtius the father of Patroclus, Amphicides, Laertes the father of Ulysses, and the four sons of Hippocoon. This troop of armed men attacked the boar, and it was at last killed by Meleager.—The conqueror gave the skin and the head to Atalanta, who had first wounded the animal. This irritated the rest, and particularly Toxeus and Plexippus the brothers of Althæa, and they endeavoured to rob Atalanta of the honourable present. Meleager defended her, and killed his uncles in the attempt. Mean time the news of this celebrated conquest had already reached Calydon, and Althæa went to the temple of the gods to return thanks for the victory which her son had gained: But being informed that her brothers had been killed by Meleager, she in the moment of resentment threw into the fire the fatal stick on which her son's life depended, and Meleager died as soon as it was consumed. Homer does not mention the firebrand; whence some have imagined that this fable is posterior to that poet's age. But he says, that the death of Toxeus and Plexippus so irritated Althæa, that she uttered the most horrible curses and imprecations upon her son's head.

Meleager, a Greek poet, the son of Eucrates, was born at Seleucia in Syria, and flourished under the reign of Seleucus VI. the last king of Syria. He was educated at Tyre; and died in the island of Coos, anciently called *Merope*. He there composed the Greek epigrams called by us the *Anthologia*. The disposition of the epigrams in this collection was often changed afterwards, and many additions have been made to them. The monk Planudes put them into the order they are in at present, in the year 1380.

MELEAGRIS, in ornithology, the Turky; a genus of birds belonging to the order of gallinæ. The head is covered with spongy caruncles; and there is likewise a membranaceous longitudinal caruncle on the throat.

There is but one (A) species, *viz.* the gallopavo, or North American turky of Ray. It has a caruncle both on the head and throat; and the breast of the male is bearded or tufted. He lives upon grain and insects: when the cock struts, he blows up his breast, spreads and erects his feathers, relaxes the caruncle on the forehead, and the naked parts of the face and neck become intensely red. Barbot informs us that very few turkies are to be met with in Guinea, and those only in the hands of the chiefs of the European forts; the negroes declining to breed any on account of their tenderness, which sufficiently proves them not to be natives of that climate. He also remarks, that neither the common poultry nor ducks are natural to Guinea any more than the turky. Neither is that bird a native of Asia: the first that were seen in Persia were brought

(A) Two others were formerly enumerated; but in the late edition of the *Syst. Nat.* by Gmelin, they have been transferred to a new genus. See Penelope.

Meleagris, Meles.

brought from Venice by fome Armenian merchants. They are bred in Ceylon, but not found wild. In fact, the turky, properly fo called, was unknown to the ancient naturalifts, and even to the old world, before the difcovery of America. It was a bird peculiar to the new continent; and is now the commoneft wild-fowl in the northern parts of that country, where they are frequently met with by hundreds in a flock: in the day-time they frequent the woods, where they feed on acorns; and return at night to the fwamps to rooft, which they do on the trees. They are frequently taken by means of dogs, though they run fafter for a time; but the dogs perfifting in the purfuit, the birds foon grow fatigued, and take to the higheft trees, where they will fuffer themfelves to be fhot one after another if within reach of the markfman. This fowl was firft feen in France in the reign of Francis I. and in England in that of Henry VIII. By the date of the reign of thefe monarchs, the firft turkies muft have been brought from Mexico, the conqueft of which was completed A. D. 1521. Ælian mentions a bird found in India, which fome writers have fufpected to be the turky; but Mr Pennant concludes with Gefner, that it was either the peacock, or fome bird of that genus.

The turky-hen begins to lay early in the fpring, and will often produce a great number of eggs, which are white, marked with reddifh or yellow fpots, or rather freckles. She fits well, and is careful of her young; of which in this climate fhe will often have from fourteen to feventeen for one brood: but fhe fcarce ever fits more than once in a feafon, except allured thereto by putting frefh eggs under her as foon as the firft fet are hatched; for as fhe is a clofe fitter, fhe will willingly remain two months on the neft, tho' this conduct, as may be fuppofed, is faid greatly to injure the bird. Turkies are bred in quantities in fome of the northern counties of England, and are driven up to London towards autumn for fale in flocks of feveral hundreds, which are collected from the feveral cottages about Norfolk, Suffolk, and neighbouring counties, the inhabitants of which think it well worth their while to attend carefully to them, by making thefe birds a part of their family during the breeding feafon. It is pleafing to fee with what facility the drivers manage them, by means of a bit of red rag faftened to the end of a flick, which, from their antipathy to it as a colour, acts with the fame effect as a fcourge to a quadruped.

Of the turky there are feveral varieties, which have arifen from domeftication. The moft common is *dark grey* inclining to black, or barred dufky white and black. There is alfo a beautiful variety of a fine deep *copper* colour, with the greater quills pure white, and the tail of a dirty white; it is when old a moft beautiful bird. A variety with a *pure white* plumage is alfo now not unfrequent, and appears very beautiful. It was once efteemed as a great rarity, and the breed fuppofed originally to have arifen in Holland. In the Leverian Mufeum is alfo a common turky, with a large *tuft* of feathers on its head, much refembling one figured by Albin.

MELES, in zoology. See Ursus.

Meles (anc. geog.), a fine river running by the walls of Smyrna in Ionia, with a cave at its head, where Homer is faid to have written his poems. And from it Homer takes his original name *Melafigenes*, given him by his mother Critheis, as being born on its banks. (Herodotus.)

Meletians || Melica.

MELETIANS, in ecclefiaftical hiftory, the name of a confiderable party who adhered to the caufe of Meletius bifhop of Lycopolis, in Upper Egypt, after he was depofed, about the year 306, by Peter bifhop of Alexandria, under the charge of his having facrificed to the gods, and having been guilty of other heinous crimes; though Epiphanius makes his only failing to have been an exceffive feverity againft the lapfed. This difpute, which was at firft a perfonal difference between Meletius and Peter, became a religious controverfy; and the Meletian party fubfifted in the fifth century, but was condemned by the firft council of Nice.

MELIA, Azaderach, or the *Bead tree*, in botany: A genus of the monogynia order, belonging to the decandria clafs of plants; and in the natural method ranking under the 23d order *Trihilatæ*. The calyx is quinquedentated; the petals five; the nectarium cylindrical, as long as the corolla, with its mouth ten-toothed: the fruit is a plum with a quinquelocular kernel. There are three fpecies, all of them exotic trees of the Indies, rifing near 20 feet high; adorned with large pinnated or winged leaves, and clufters of pentapetalous flowers. They are all propagated by feeds fown on hot-beds.

MELIANTHUS, Honey-flower, in botany: A genus of the angiofpermia order, belonging to the didynamia clafs of plants; and in the natural method ranking under the 24th order *Corydales*. The calyx is pentaphyllous, with the lowermoft leaf gibbous: there are four petals, with the nectarium under the loweft ones. The capfule is quadrilocular. There are two fpecies. 1. The major hath a thick, ligneous, fpreading root; many upright, ligneous, durable ftalks, rifing fix or eight feet high; garnifhed with large pinnated leaves, of four or five pair of ferrated lobes terminated by an odd one; and, from the fides and tops of the ftalks, long fpikes of chocolate-coloured flowers. 2. The minor hath a root like the former; upright, ligneous, foft, durable ftalks, rifing four or five feet high; garnifhed with fmaller pinnated leaves; and from the fides and ends of the branches, long, loofe, pendulous bunches of flowers tinged with green, faffron colour, and red.—Both the fpecies flower about June: but rarely produce feeds in this country. They are very ornamental, both in foliage and flower, and merit admittance in every collection. They are eafily propagated by fuckers and cuttings. They thrive beft in a dry foil, and in a fheltered warm expofure.

MELIBOEA (anc. geog.), an ifland of Syria, at the mouth of the Orontes; which, before it falls into the fea, forms a fpreading lake round it. This ifland was famous for its purple dye. Thought to be a colony of Theffalians; and hence Lucretius's epithet, *Theffalicus*.

MELICA, ropegrass: A genus of the digynia order, belonging to the triandria clafs of plants; and in the natural method ranking under the 4th order *Gramina*. The calyx is bivalved, biflorous, with an embryo of a flower betwixt the two florets. There are three fpecies; of which the moft remarkable is the nutans. It is a native of several parts of Britain, and the adjacent islands; and the inhabitants of some of the western islands make ropes of it for fishing-nets, as it will bear the water for a long time without rotting.

MELICERES, in surgery, a kind of encysted tumors, so called when their contents are of the consistence of honey.

MELICERTA, Melicertes, or *Melicertus* (fab. hist.), a son of Athamas and Ino. He was saved by his mother from the fury of his father, who prepared to dash him against a wall as he had done his brother Learchus. The mother was so terrified that she threw herself into the sea with Melicerta in her arms. Neptune had compassion on the misfortunes of Ino and her son. He changed them both into sea deities. Ino was called *Leucothoë* or *Matuta*; and Melicerta was known among the Greeks by the name of *Palæmon*, and among the Latins by that of *Portumnus*. Some suppose that the Isthmian games were instituted in honour of Melicerta.

MELILLA, an ancient town of Africa in the kingdom of Fez, and in the province of Garet. It was taken by the Spaniards in 1469, but returned back to the Moors. W. Long. 2 9. N. Lat. 35. 20.

MELILOT. See Trifolium.

MELINDA, a kingdom on the east coast of Africa, situated, according to some, between the third and fourth degree of south latitude; though there is great disagreement among geographers as to its extent. It is allowed by all, however, that the coasts are very dangerous; being full of rocks and shelves, and the sea at some seasons very liable to tempests. The kingdom of Melinda is for the most part rich and fertile; producing almost all the necessaries of life except wheat and rice, both which are brought thither from Cambaya and other parts; and those who cannot purchase them make use of potatoes in their stead, which are here fine, large, and in great plenty. They likewise abound with great variety of fruit-trees, roots, plants, and other esculents, and with melons of exquisite taste. They have also great plenty of venison, game, oxen, sheep, hens, geese, and other poultry, &c. and one breed of sheep whose tails weigh between 30 and 40 pounds. The capital city is also called *Melinda*.

MELINUM, in natural history, the name of an earth famous in the earliest ages of painting, being the only white of the great painters of antiquity; and, according to Pliny's account, one of the three colours with which alone they performed all their works. It is a fine, white, marly earth, of a very compact texture, yet remarkably light; a sort of texture which must render any earth fit for the painter's use that is of a proper colour. It is frequently found forming a stratum in the earth, lying immediately under the vegetable mould. It is of a very smooth but not glossy surface; is very soft to the touch; adheres firmly to the tongue; is easily broken between the fingers; and stains the skin in handling. It melts readily in the mouth, and is perfectly fine; leaving not the least grittiness between the teeth: thrown into water, it makes a loud bubbling and hissing noise, and moulders away into a fine powder. It does not ferment with acids; and suffers no change in the fire. These are the characters by which the melinum of the ancients is distinguished from all other white earths. It is still found in the same place from which the painters of old had it, *viz.* the isle of Milo or Melos, from whence it had its name; and is common in most of the adjacent islands. It has of late been tried here; but is found not to make such a bright paint as the other substances now employed. It is not, however, liable, like them, to turn yellow: hence it would seem to be worth the consideration of persons in the colour-trade; especially as it might be had in any quantities for the carriage.

MELISSA (fab. hist.), a daughter of Melissus king of Crete, who with her sister Amalthæa fed Jupiter with the milk of goats. She first found out the means of collecting honey; whence it has been fabled that she was changed into a bee, as her name is the Greek word for that insect.

MELISSA, Baum: A genus of the gymnospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 42d order *Verticillatæ*. The calyx is arid, a little plane above, with the upper lip having its dents nearly of equal height: the upper lip of the corolla is arched and bifid; the under one, with the middle lobe, cordated. There are several species; but the most remarkable are the following. 1. The officinalis, or common baum, has fibrous perennial roots; many upright, square, branchy, annual stalks, rising two or three feet high: garnished with oblong, indented, opposite leaves, by pairs, two or three inches long, and half as broad; and from the upper axillas verticillate clusters of small white flowers upon single footstalks. There is also a kind with variegated leaves. 2. The grandiflora, or Hetrurian calamint, hath fibrous perennial roots and annual stalks, rising about a foot high, garnished with oblong, oval, indented, hairy, opposite leaves; and from the upper axillas verticillate clusters of large purple flowers on forked footstalks. 3. The calamintha, or common calamint of the shops, has fibrous perennial roots; upright, square, branchy hairy stalks, rising a foot high; roundish, indented, opposite leaves; and verticillate clusters of small bluish flowers, on forked footstalks as long as the flowers. All these species are easily propagated by offsets.

Medicinal uses. The first species, when in perfection, has a pleasant smell, somewhat of the lemon kind; and a weak, roughish, aromatic taste. The young shoots have the strongest flavour; the flowers, and the herb itself when old or produced in very rich moist soils or rainy seasons, are much weaker both in smell and taste. Baum is appropriated, by the writers on the materia medica, to the head, stomach, and uterus; and in all disorders of these parts is said to do extraordinary service. So high an opinion have some chemists entertained of this plant, that they have expected to find in it a medicine which should prolong life beyond the usual period. The present practice, however, holds it in no great esteem; and ranks it (where it certainly deserves to be) among the weaker corroborants. Infusions of the leaves in water smell agreeably of the herb, but have not much taste, though on being inspissated they leave a considerable quantity of a bitterish austere extract. Infusions of baum do not, like other aromatics, offend

offend the head, as is complained of from sage, &c. Cold infusions in water or spirit are far better than the cohobated distilled water, and are the best preparations from the plant. On distilling the fresh herb with water, it impregnates the first running pretty strongly with its grateful flavour. When large quantities are subjected to the operation at once, there separates and rises to the surface of the aqueous fluid a small portion of essential oil, which some call *ol. Syriæ*, and others *ol. Germanis*. It is of a yellowish colour, and of a very fragrant smell.

MELISSUS of Samos, a Greek philosopher, was the son of Rhagines and the disciple of Parmenides; and lived about 440 B. C. He pretended that the universe is infinite, immoveable, and without a vacuum. Themistocles was among his pupils.

MELITE (anc. geog.), an island referred to Africa by Scylax and Ptolemy; but nearer Sicily, and allotted to it by the Romans: commended for its commodious harbours; for a city well built, with artificers of every kind, especially weavers of fine linen; all owing to the Phœnicians the first colonists. Now *Malta*; remarkable for St Paul's shipwreck. See Malta.

Melite, *Melita*, or *Melitina Infula*; an island on the coast of Illyricum in the Adriatic. The *Catuli Melitæi* (Pliny) were famous. Now *Melede*, the name of the island Samos. See Samos.

Melite (anc. geog.), a town of Ionia, struck out of the number of Ionian towns on account of the arrogance of the people, and Smyrna admitted in lieu of it. The situation not said.

MELITENSIS terra, the *Earth of Malta*: an earth of which there are two very different kinds; the one of the genus of boles, the other of the marles. The latter is that known by medicinal authors under this name; the former is the Malta earth now in use: but both being brought from the same place, are confusedly called by the same name. The Maltese marle, which is the *terra Melitensis* of medicinal authors, is a loose, crumbly, and very light earth, of an unequal and irregular texture; and, when exposed to the weather, soon falls into fine soft powder: but when preserved and dried, it becomes a loose, light mass, of a dirty white colour, with a greyish cast: it is rough to the touch, adheres firmly to the tongue, is very easily crumbled to powder between the fingers, and stains the hands. Thrown into the water, it swells, and afterwards moulders away into a fine powder. It ferments very violently with acid menstruums. Both kinds are found in great abundance in the island of Malta, and the latter has been much esteemed as a remedy against the bites of venomous animals. The other has supplied its place in the German shops; and is used there as a cordial, sudorific, and astringent.

MELITO (canonized), bishop of Sardis in Lydia, in the second century; remarkable for the apology he presented to the emperor Aurelius, in favour of the Christians; on which Eusebius and the other ancient ecclesiastical writers bestow great praises: but that apology and all Melito's other works are lost.

MELITUS, a Greek orator and poet, the accuser of Socrates. The Athenians, after the death of Socrates, discovering the iniquity of the sentence they had passed against that great philosopher, put Melitus to death, 400 B. C.

MELLAN (Claude), an engraver of considerable note, was a native of Abbeville in Picardy, and born in 1601. His father was the receiver of the customs in that town; and he took great care of the education of his son. His genius for drawing discovering itself very early in life, he was sent to Paris, and placed under the direction of Simon Vouet in order to perfect himself in that art, and his studies promised success; but he was diverted from his application to them by the desire he had of learning the management of the graver, which he acquired with much facility. From Paris, at the age of sixteen, he went to Rome, where he engraved a considerable number of plates, many of which are held in great estimation; particularly those for the Justinian Gallery, the portrait of the Marquis Justinian, and that of Pope Urban VIII. Returning to France, he married at Paris, and settled there in 1654. The king of France being made acquainted with his merit, assigned him apartments in the Louvre, in the double quality of a painter and an engraver. He acquired a competent fortune, and was greatly esteemed by all who knew him. He died in 1688, aged 87.

Florent le Comte tells us, "That Charles II. was so much pleased with his performances, that he invited him to come into England, making him at the same time very advantageous offers. But the love of his country (continues that author) prevented his accepting of them."

It is remarked, that most of the plates which he engraved at Rome, and before he went thither, are executed in the usual manner; that is, with parallel strokes, crossed with second and third strokes, as the depth of the shadows might require. But afterwards he adopted a new mode of working with single strokes only, without any second strokes laid upon them; and the shadows are expressed by the same strokes being made stronger and brought nearer to each other. The effect which he produced by this method of engraving is soft and clear. In single figures and small subjects he succeeded very happily; but in large compositions, where great depth of shadow was required, he has failed. His neatest plates in this style have an unfinished appearance, by no means suitable to large engravings; but at the same time a lightness exceedingly agreeable when confined to small ones. According to Le Comte, the works of this master amount to 342.

MELLER, a lake of Sweden, 80 miles long, and 30 broad; on which stands the city of Stockholm.

MELLI, with the country of the Mundingoes, in Africa. The country formerly called *Melli*, now chiefly inhabited by the Mundingoes, who still retain pretty much of the character ascribed to the people of Melli, lies to the south of the river Gambia; on the west it borders on the kingdom of Kabo; on the south it has *Melli*, properly so called, and the mountains that part it from Guinea; and on the east it extends to the kingdom of Gago. A great part of this country we are little acquainted with; as is the case with regard to most of the inland territories of Africa, but towards the sea-coast this country is a little better known.

The first place of note we meet with is Kachao, a Portuguese colony, situated on the river of St Domingo, which falls into the sea about 26 leagues below this

this town.—About 26 leagues above Kachao, on the same side of the river, is another trading town called *Farini*, where, in the months of October and November, one may trade for about half the quantity of wax and ivory which is traded for at Kachao. Here are also some slaves to be bought.—Bot is a village near the mouth of the river Gesves, where most of the traders buy rice; which is in great plenty there, and very good.—Gesves is a village on a river of the same name, on which the Portuguese have a factory. At Gesves one may trade yearly for 250 slaves, 80 or 100 quintals of wax, and as many of ivory. Near the mouth of the river of Gesves is a village called *Kurbali*, where there is a considerable trade for salt; here are also some slaves and ivory. Rio Grande, or the Great River, runs about 10 or 12 leagues to the south of the river of Gesves. About 80 leagues from the mouth of it is a nation of Negroes, who are good traders in ivory, rice, millet, and some slaves. They are called *Analons*. Over-against the mouth of Rio Grande is a cluster of islands called *Bissago Isles*; the most considerable of which is Cassagut, being about six leagues long and two broad; its soil is very good, and produces millet, rice, and all kinds of pulse, besides orange and palm-trees, and many others. This island, with those of Carache, Canabac, and La Gallina, are the only ones where the Europeans may trade with some security. They trade, however, sometimes at the other islands, but they must be extremely cautious; and yet after all their precautions, they will be robbed and murdered if they venture to go ashore. The river Nunho runs 16 leagues to the south of Rio Grande; it is very considerable, and comes from a vast distance in-land. One may buy here 300 quintals of ivory and 100 slaves a-year. Rice grows here admirably well, and is very cheap. There are every-where sugar-canes which grow naturally; and plants of indigo, which might turn to good account. The trade is carried on here from March till August. In the river of Sierra Leone, the late Royal African company of England had, in the year 1728, two islands; the one, called *Tasso*, a large flat island, near three leagues in circumference, in which the company's slaves had a good plantation; the rest of the island is covered with wood, among which are silk-cotton trees of an unaccountable size. The other island is *Bense*, whereon stood a regular fort. It was formerly the residence of one of the English chiefs.

MELMOTH (William, Esq;), a learned and worthy bencher of Lincoln's Inn, was born in 1666. In conjunction with Mr Peere Williams, Mr Melmoth was the publisher of Vernon's Reports, under an order of the court of chancery. He had once an intention of printing his own Reports; and a short time before his death advertised them at the end of those of his coadjutor Peere Williams, as then actually preparing for the press. They have, however, not yet made their appearance. But the performance for which he justly deserves to be held in perpetual remembrance is, "The Great Importance of a Religious Life;" concerning which it may be mentioned, to the credit of the age, that notwithstanding many large editions had before been circulated, 42,000 copies of this useful treatise have been sold in the last 18 years. It is a somewhat singular circumstance, that the real author of this most admirable treatise should never before have been publicly known (it having been commonly attributed to the first earl of Egmont, and particularly by Mr Walpole in his Catalogue); which is the more surprising, as the author is plainly pointed out in the following short character prefixed to the book itself: "It may add weight, perhaps, to the reflections contained in the following pages, to inform the reader, that the author's life was one uniform exemplar of those precepts which, with so generous a zeal, and such an elegant and affecting simplicity of style, he endeavours to recommend to general practice. He left others to contend for modes of faith, and inflame themselves and the world with endless controversy: it was the wiser purpose of his more ennobled aim, to act up to those clear rules of conduct which revelation hath graciously prescribed. He possessed by temper every moral virtue; by religion every Christian grace. He had a humanity that melted at every distress; a charity which not only thought no evil, but suspected none. He exercised his profession with a skill and integrity which nothing could equal but the disinterested motive that animated his labours, or the amiable modesty which accompanied all his virtues. He employed his industry, not to gratify his own desires; no man indulged himself less: not to accumulate useless wealth; no man more disdained so unworthy a pursuit: it was for the decent advancement of his family, for the generous assistance of his friends, for the ready relief of the indigent. How often did he exert his distinguished abilities, yet refuse the reward of them, in defence of the widow, the fatherless, and him that had none to help him! In a word, few have ever passed a more useful, not one a more blameless life; and his whole time was employed either in doing good or in meditating it. He died on the 6th day of April 1743, and lies buried under the cloister of Lincoln's Inn Chapel. MEM. PAT. OPT. MER. FIL. DIC." The son, by whom this character is drawn, is William Melmoth, Esq; the celebrated translator of Pliny and of Cicero's Letters; and author of those which pass under the name of *Sir Thomas Fitzosborne*.

MELOCHIA, Jews mallow, in botany: A genus of the pentandria order, belonging to the monodelphia class of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The capsule is quinquelocular and monospermous. There are several species; but the only remarkable one is the olitorius, or common Jews-mallow, which is a native of the warm parts of Asia and America.—It is an annual plant, which rises about two feet high, dividing into several branches, garnished with leaves of different sizes and forms: some are spear-shaped, others are oval, and some almost heart-shaped: they are of a deep green, and slightly indented on their edges, having near their base two bristly reflexed segments. They have very long slender footstalks, especially those which grow on the lower part of the branches. The flowers sit close on the opposite side of the branches to the leaves, coming out singly; they are composed of five small yellow petals, and a great number of stamina surrounding the oblong germen, which is situated in the centre of the flower, and afterwards turns to a rough swelling capsule two inches long, ending in a point, and

and having four cells filled with angular greenifh feeds. This fpecies is cultivated about the city of Aleppo in Syria, and in the Eaft Indies, as a pot-herb; the Jews boiling the leaves, and eating them with their meat. It is fuppofed by Rauwolf to be the *olus Judaicum* of Avicenna, and the *corchorum* of Pliny.

MELODUNUM, (anc. geog.), a town of the Cenones in Gallia Celtica above Lutetia; now *Melun*, in the ifle of France, on the Seine.

MELODY, in mufic, a fucceffion of founds ranged in fuch a manner, according to the laws of rhythmus and modulation, that it may form a fentiment agreeable to the ear. Vocal melody is called *finging;* and that which is performed upon inftruments may be termed *fymphonic melody*.

The idea of rhythmus neceffarily enters into that of melody. An air is not an air but in proportion as the laws of meafure and quantity are obferved. The fame fucceffion of founds is fufceptible of as many different characters, as many different kinds of melody, as the various ways by which its emphatic notes, and the quantities of thofe which intervene, may be diverfified; and the change in duration of the notes alone, may difguife that very fucceffion in fuch a manner that it cannot be known. Thus, melody in itfelf is nothing; it is the rhythmus or meafure which determines it, and there can be no air without time. If then we abftract meafure from both, we cannot compare melody with harmony; for to the former it is effential, but not at all to the latter.

Melody, according to the manner in which it is confidered, has a relation to two different principles. When regarded only as agreeable to the proportions of found and the rules of modulation, it has its principle in harmony; fince it is a harmonical analyfis, which exhibits the different gradations of the fcale, the chords peculiar to each mode, and the laws of modulation, which are the fole elements that compofe an air. According to this principle, the whole power of melody is limited to that of pleafing the ear by agreeable founds, as the eye may be pleafed with an agreeable affemblage of fuitable colours. But when confidered as an imitative art, by which we may affect the mind with various images, excite different emotions in the heart, inflame or foothe the paffions; by which, in a word, we produce different effects upon our moral faculties, which are not to be effectuated by the influence of external fenfe alone, we muft explore another principle for melody: for in our whole internal frame there appears to be no power upon which either harmony alone, or its neceffary refults, can feize, to affect us in fuch a manner.

What then is the fecond principle? It is as much founded on nature as the firft; but, in order to difcover its foundation in nature, it will require a more accurate though fimpler obfervation, and a more exquifite degree of fenfibility in the obferver. This principle is the fame which varies the tone of the voice, when we fpeak, according as we are interefted in what we fay, and according to the different emotions which we feel in expreffing it. It is the accent of languages which determines the melody of every nation; it is the accent which determines us to employ the emphafis of fpeaking while we fing, and to fpeak with more or lefs energy according as the language which we ufe is more or lefs accented. That language whofe accents are the moft fenfible, ought to produce a more paffionate and more lively melody; that which has little accentuation, or none at all, can only produce a cold and languid melody, without character and without expreffion. Thefe are the true principles: in proportion as we depart from them, when we fpeak of the power of mufic upon the human heart, we fhall become unintelligible to ourfelves and others; our words will be without meaning.

If mufic does not imprefs the foul with images but by melody, if from thence it obtains its whole power, it muft follow, that all mufical founds which are not pleafing by themfelves alone, however agreeable to harmony they may be, is not an imitative mufic; and, being incapable, even with its moft beautiful chords, either to prefent the images of things, or to excite the finer feelings, very foon cloys the ear, and leaves always the heart in cold indifference. It follows likewife, that notwithftanding the parts which harmony has introduced, and which the prefent tafte of mufic fo wantonly abufes, wherever two different melodies are heard at the fame time, they counteract each other, and deftroy the effects of both, however beautiful each may be when performed alone: from whence it may be judged with what degree of tafte the French compofers have introduced in their operas the miferable practice of accompanying one air with another, as well in finging, which is the native expreffion of pathos and fentiment, as in inftrumental performances; which is the fame thing as if whimfical orators fhould take it in their heads to recite two orations at the fame time, that the elegance of each might derive more force from the other.

So much for Rouffeau The tranflator, however, has reafon to fear, that the caufes by which national melody is diverfified and characterifed, are more profound and permanent than the mere accentuation of language. This indeed may have great influence in determining the nature of the rhythmus, and the place of emphatic notes; but very little in regulating the nature of the emphafis and expreffion themfelves. If Rouffeau's principle be true in its full extent, he muft of neceffity acknowledge, that an air which was never fet or intended for words, however melodious, cannot be imitative: he muft likewife confefs, that what is imitative in one nation cannot be fuch in another: nor can it be denied upon his hypothefis, that the recitative, which is formed upon the mode of fpeaking, is the moft forcible of all melodies; which is abfurd. His other obfervations are at once judicious and profound. Though it is impoffible to exhibit the beauty and variety of harmony by playing the fame melody at the fame time upon different keys, admitting thofe keys to form among themfelves a perfect chord, which will of confequence preferve all the fubfequent notes in the fame intervals; yet this perfect harmony would by no means be uniformly pleafing to the ear. We muft therefore of neceffity introduce lefs perfect chords to vary and increafe the pleafure, and thefe chords in any complex fyftem of mufic muft of neceffity produce diffonances. It then becomes the bufinefs of the compofer to be careful that thefe difcords may arife as naturally from, and return as naturally to, perfect har-

 mony,

Meloe. mony as possible. All these causes must inevitably vary the melody of the different parts; but still, amidst all these difficulties, the artist ought to be zealous in preserving the melody of each as homogeneous with the others as possible, that the result of the whole may be in some measure uniform. Otherwise, by counteracting each other, the parts will reciprocally destroy the effects one of another.

MELOE, in zoology; a genus of insects of the order of coleoptera. The antennæ are jointed, the last joint being oval; the breast is roundish; the elytra are soft and flexible; and the head is inflected, and gibbous. The insects of this genus are divided into two families; one without wings, and having the elytra shorter than the abdomen; the other winged, with elytra shorter than the body and wholly covering the wings.—The most remarkable species are,

1. The proscarabæus; the colour of which is black, but without brightness, though intermixed with a small degree of purple, especially towards the under part of the body. Its head, which is large, is dotted; as is the thorax, which is narrower, round, and without a margin. The elytra are as soft as leather, shagreened, and cover but part of the abdomen. They are, as it were, cut off obliquely from the inner to the outer part, being shorter towards the suture, longer on the sides. There are no wings under the elytra. The abdomen is large, especially that of the female, in which it far exceeds the elytra.—This insect makes its abode on the side of wet roads and in woods. Its food are insects, violet leaves, and delicate herbs. There oozes from its body a fat unctuous matter of an agreeable smell. The males are less than the females.

2. The vesicatorius, or blistering meloe, is nine or ten lines in length, of a shining green colour mixed with azure. It multiplies greatly. They are sometimes seen flying in swarms. A nauseous smell, not unlike that of mice, bespeaks their approach; which scent leads to the discovery of them when they are sought for in order to make a provision. When dried, they are so light, that 50 scarce weigh one dram. They prey upon the leaves of trees and shrubs, and in preference take to those of the ash-tree. The odorous particles exhaled by these insects, are extremely corrosive. Great caution should be used in picking them up. People have been known to be seized with violent heat of urine, voiding of blood, for having gathered a quantity of them during the heat of the sun with their hands bare, or for having fallen asleep under trees where swarms of them had settled. The copulation of these insects is performed during the most intense heat of the day.

There are many other species, differing in size, figure, and colour. Nature has apparelled almost all of them in a splendid manner. Green, azure, and gold, render them dazzling to the eyes. They are most common in the southern parts of the continent. In this genus, as well as in some others, the females court, and in the act take the place of the males. The females deposit their eggs in the ground, whence proceed larvæ, which pass through the state of chrysalids in order to attain to that of meloes.

Uses. Oil in which insects of the *first* species have been infused is said to be an excellent topical for wounds and the scorpion's sting. It enters also into the composition of salve for plague sores. The insects bruised and mixed with oil or honey, Linnæus says, are commended as a remedy in the rabies canina.

The *second* species is the cantharis of the shops; which, when bruised, is universally used as a blistering plaster. The largest and most esteemed of this sort come from Italy. Cantharides are extremely acrimonious: applied to the skin, they first inflame, and afterwards excoriate the part, raising a more perfect blister than any of the vegetable acrids, and occasioning a more plentiful discharge of serum. All the blistering compositions have cantharides for their basis. The external application of cantharides is often followed by a strangury, accompanied with thirst and feverish heat: this inconvenience may be remedied by soft unctuous or mucilaginous liquors liberally drank.

Cantharides taken internally often occasion a discharge of blood by urine, with exquisite pain. If the dose is considerable, they seem to inflame and exulcerate the whole intestinal canal; the stools become mucous and purulent; the breath fetid and cadaverous; intense pains are felt in the lower belly; the patient faints, grows giddy, raving mad, and dies. All these terrible consequences have sometimes happened from a few grains. Herman relates, that he has known a quarter of a grain inflame the kidneys, and occasion bloody urine with violent pain. There are nevertheless cases in which this stimulating fly, given in larger doses, proves not only safe, but of singular efficacy for the cure of diseases that yield little to medicines of a milder class. In cold phlegmatic sluggish habits, where the viscera are overloaded, and the kidneys and ureters obstructed with thick viscid mucous matter, cantharides have excellent effects: here the abounding mucus defends the solids from the acrimony of the fly, till it is itself expelled; when the medicine ought to be discontinued. Groenvelt employed cantharides with great success in dropsies, obstinate suppressions of urine, and ulcerations of the bladder; giving very considerable doses made into boluses with camphor; and interposing large draughts of emulsions, milk, or other emollent liquids: by this means, the excessive irritation, which they would otherwise have occasioned, was in great measure prevented. The camphor did not perhaps contribute so much to this effect as is generally imagined, since it has no sensible quality that promises any considerable abatement of the acrimony of cantharides: nitre would answer all that the camphor is supposed to perform; this, with milk, or emollient mucilaginous liquors, drank in large quantity, are the best correctors. Cantharides, in very small doses, may be given with safety also in other cases. Dr Mead observes, that the obstinate gleetings which frequently remain after the cure of venereal maladies, and which rarely yield to balsamic medicines, are effectually remedied by cantharides; and that no one remedy is more efficacious in leprous disorders; in which last, proper purgatives are to be occasionally taken during the use of the cantharides. The best and safest preparation of cantharides for these purposes, is a spirituous tincture; and indeed, in all cases, the tincture is far preferable, for internal use, to the fly in substance.

The virtues of cantharides are extracted by rectified spirit

Melon. ſpirit of wine, proof ſpirit, and water; but do not ariſe in diſtillation. The watery and ſpirituous extracts bliſter as freely as the fly in ſubſtance; whilſt the fly remaining after the ſeveral menſtrua have performed their office, is to the taſte inſipid, and does not in the leaſt bliſter or inflame the ſkin.

See Cucumis. MELON, in botany, a ſpecies of CUCUMIS *, in the Linnæan ſyſtem. The female flowers have no ſtamina or ſummits, but have a very large oval germen, ſituated below the flower, which turns to an oval fruit with ſeveral cells, filled with oval, acute-pointed, compreſſed ſeeds, incloſed in a ſoft pulp. There is a great variety of this fruit cultivated in different parts of the world, many of them of no value, ſize being regarded too much in the markets. The *Cantaleupe melon*, ſo called from a place in the neighbourhood of Rome, where this fruit has been long cultivated, and whither it was brought from Armenia, is in the greateſt eſteem among the curious in every part of Europe. Beſides this, there are alſo the *romana*, the *ſuccado*, the *Zatte*, the ſmall *Portugal* or *dormer*, and the black *Galloway* melons, moſt of which are cultivated for an early crop.

The proper management and culture of melons are as follow: the ſeeds ſhould be procured from good melons, of the soundeſt ſort and higheſt flavour, produced, as ſome have adviſed, in a diſtant garden; for if ſown on the place where it was raiſed and ripened, it is very apt to degenerate. This ſeed ſhould be kept three years before it is ſown, but not more than ſix; and it ſhould be ſown at two ſeaſons, or if at three it will be ſtill better: the firſt for the early crop, to be raiſed under frames, ſhould be ſown about the middle of February; the ſecond, to be raiſed in the ſame manner, is to be ſown about the middle of March; and thoſe which are deſigned for hand or bell-glaſſes, or to be covered with oil-papers, ſhould not be ſown till about a week in April.

For thoſe of the firſt ſeaſon, the ſeeds may be ſown on the upper ſide of a cucumber-bed, if there be any; or, a proper quantity of new looſe dung muſt be provided, and thrown on a heap to ferment, and turned over, that it may acquire an equal heat; and the plants muſt be raiſed and managed like cucumbers, until they are planted where they are to remain. The beds or ridges, where the plants are to remain, ſhould be placed in a warm ſituation, ſo that they may be defended from all cold and ſtrong winds, and incloſed in a good reed fence. In preparing the earth for theſe plants, the Dutch and German gardeners form a mixture of a third part of hazel loam, a third part of the ſcouring of ditches and ponds, and the ſame quantity of very rotten dung; which they mix up at leaſt one, and often two years, before they make uſe of it, frequently turning it over, ſo that the parts may be well incorporated; but the compoſt in which Mr Miller has found melon plants to ſucceed beſt in England is two-thirds of freſh gentle loam, and one-third of rotten neat's dung: if theſe are mixed together one year before it is wanted, ſo as to have the benefit of a winter's froſt and ſummer's heat, obſerving to turn it over often, and never ſuffering weeds to grow upon it, this will be found equal to any compoſt whatever. Before the plants appear, there ſhould be a quantity of new dung thrown in a heap, allowing about 15 wheelbarrows full to each light; which muſt be turned over two or three times, and in a fortnight it will be fit for uſe; when the trench muſt be dug to receive the dung where the bed is deſigned to be made, which in a dry ground ſhould not be leſs than a foot or a foot and a half deep. The frames ſhould then be placed over the bed to keep out the wet; but no earth ſhould be laid upon it for three or four days, till it is found of a proper temperature of heat. When this is the caſe, the earth may be laid upon it, about two inches thick, except in the middle of each light, where the plants are to be placed, which muſt be raiſed into a hill 15 inches high or more, terminating in a flat cone: in two or three days after the earth is put on the bed, it will be of a proper temper to receive the plants; which ſhould be carefully taken up with a trowel, ſo as to preſerve all the fibres of their roots; or if the beds cannot be ready for them in time, ſoon after the third or rough leaf is put out, it will be a good method to put each plant into a ſmall pot while they are young, and theſe may be plunged into the hot-bed where they were raiſed, or in a cucumber-bed, where there is room; and when the bed is ready, the plants may be turned out of the pots, with the whole ball of earth to their roots: and this is the beſt method for the Cantaleupe melon. When the plants are placed on the tops of the hills, they ſhould be gently watered once or twice, till they have taken good root; and when they are well fixed in the new beds, a greater quantity of earth ſhould be laid on the beds, preſſed down as cloſe as poſſible, and raiſed at leaſt a foot and a half thick upon the dung all over the bed; obſerving alſo to raiſe the frames, that the glaſſes may not be too near the plants, leſt the ſun ſhould ſcorch them. When the plants have four leaves, the top of the plants ſhould be pinched off with the finger and thumb, that they may put out lateral branches for producing the fruit; and when two or more of theſe lateral ſhoots are produced, they muſt alſo be pinched to force out more. The management of theſe beds is much the ſame as that of cucumbers, except that melons require more air and very little water. In five or ſix weeks the plants will ſpread over the bed, and reach to the frames, when the alleys between the beds ſhould be dug out; or in caſe of one bed, a trench ſhould be made on each ſide about four feet wide, as low as the bottom of the bed; and hot dung wheeled in for a lining, to the ſame height as the dung of the bed; this ſhould be trodden down cloſe, and covered with the ſame earth that was laid on the bed, to the thickneſs of a foot and a half or more, treading it down as cloſe as poſſible. In this way the bed will be extended to the width of 12 feet, that the roots of the plants may ſpread quite through it; and the beds will alſo require a freſh warmth, which will be of great ſervice in ſetting of the fruit. When the vines have extended ſo as to fill the frames, and want more room, the frames ſhould be raiſed up with bricks about three inches high, to admit the ſhoots of the vines to run out under them. When the fruit appears, the vines ſhould be carefully looked over three times a week; and one ſhould be choſen upon each runner that is ſituated neareſt the ſtem, having the largeſt foot-ſtalk, and appearing to be the ſtrongeſt fruit; then pinch off all the other fruit which may appear upon the ſame runner, and pinch off the end of the runner at the third joint above the fruit; and if the runner is gently pinched at the next

Melon. joint above the fruit, it will stop the sap and set the fruit. There is also another method practised by some gardeners to set this fruit, which is the taking off some of the male flowers, whose farina is just ripe and fit for the purpose, laying them over the female fruit, and gently striking with the nails the male flowers, to shake the farina into the female flowers; whereby they are impregnated, and the fruit will soon after swell, and manifest visible signs of being perfectly set; so that where the plants are under frames, and the wind excluded from them, which is wanted to convey the farina from the male to the female flowers, this practice may be very necessary. The glasses of the hot-bed should also be raised high, to admit a large share of air to the plants, otherwise the fruit will not set; and if the season should prove very warm, the glasses may be frequently drawn off, especially in an evening, to receive the dews, provided there is little wind stirring: but they should not remain off the whole night, lest the cold should prove too great. When the plants have extended themselves from under the frames, in cold weather their extremities should be covered every night with mats, and the plants should be watered once in a week in dry warm weather, in the alleys between the beds.

For those melons that are raised under bell or hand-glasses, the plants should be raised in the manner already directed, and about the latter end of April, in a forward season, the beds may be made. For this purpose, a sufficient quantity of hot-dung should be provided, allowing eight or nine good wheel-barrows of dung to each glass. For one bed extended in length, the trench should be cut out three-one-half feet wide, and of such a length, that the glasses may not be placed nearer than four feet to each other: in digging the trench, it should be so situated, as to allow for the widening of the bed three or four feet on each side; the depth must depend on the nature of the soil; and when there is no danger of the beds being injured by the wet, the lower it is made the better. When the dung, prepared as before, is laid on the bed, there should be a hill for each plant, one foot and a half high, and the other part need not be covered more than four inches thick; the glasses should then be placed over the hills, and in two or three days after the beds are made they will be fit for receiving the plants, which should be removed in the manner already directed. These plants must be watered at first, to settle the earth to their roots, and shaded every day, till they have taken new root; and if the nights prove cold, it will be proper to cover the glasses with mats, in order to preserve the warmth of the bed. If several beds are made, they should be placed at eight feet distance from each other. When the plants have taken good root, their tops must be pinched off, and the pruning must be the same as for those under frames. In the day-time, when the weather is warm, the glasses should be raised on the opposite side to the wind, to admit fresh air to the plants; and when they reach the sides of the glasses, in favourable weather the glasses must be set up on three bricks, that the vines may have room to run out under them; but when this is done, the beds should be covered all over with earth to the depth of one foot and an half, and trod down as close as possible; and in cold nights, the beds should be covered with mats. And as the vines of the Cantaleupe melons cannot bear wet without injury, it will be necessary to arch the beds over with props to support the mats, that they may be ready for covering at all times when they require it. If the weather should prove cold, hot dung may be laid to these beds in the manner directed for those under frames. Some have lately raised their melons with considerable success under oiled paper; but great care must be taken not to keep these coverings too close over them. And Miller advises to bring up the plants under hand or bell glasses, till they begin to extend themselves under the glasses, and then, instead of the covering of mats, to put over them the paper done over with linseed oil.

The farther management of melons, after their fruit is set, is to keep pulling off all the superfluous fruit, and to pinch off all weak runners; and also to turn the fruit gently twice a-week, that each side may have equal benefit of the sun and air. When the fruit is fully grown, care should be taken to cut it at a proper time; for if it is left a few hours upon the vines, it will lose much of its delicacy; therefore the vines should be looked over at least twice in a day: and if the fruit intended for the table is cut early in the morning, before the sun has warmed it, it will be much better flavoured; but if it should be necessary to cut any afterwards, it should be put into cold spring water or ice to cool it, before it is brought to table; and that cut in the morning should be kept in the coolest place till it is used. The signs of this fruit's maturity is, its beginning to crack near the foot-stalk, and its beginning to smell, which never fail: but the Cantaleupe melons seldom change their colour till they are too ripe.

Mr Reynolds has communicated to the Society of Arts the following method of raising melons without earth, dung, or water. About a month before the seeds are sown, he prepares a bed of cast-off tanner's bark, four feet deep, six feet wide, and twelve feet in length: this he covers with four lights, so as not to admit rain or water. March (he says) is a proper season for this purpose. When the bed becomes warm, which generally happens in about 20 days, a few melon seeds are put into warm milk in an earthen vessel, which is pressed down into the bark-bed, where it remains 36 hours, in order to promote the vegetation of the seeds. Then, at equal distances, he directs to open four holes in the bed, each nine inches in diameter, and five inches deep; having in readiness about a peck of pounded bark, like saw-dust, some of it to be put at the bottom of the holes, to the thickness of three inches: on this bark some of the seeds are to be placed, and pressed down with the fingers; then the seeds are to be covered with two inches more of the powdered bark, pressing the whole down with the hand. When the plants are advanced to a proper size, the best are chosen and the others cast away; those that are reserved are ordered to be properly pruned, and to have as much warm air as possible during the summer. In this way (he says) he has raised as good melons as can be desired.

When a melon is perfectly fine, it is full, without any vacuity: this is known by knocking upon it; and when cut, the flesh must be dry, no water running

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out, only a little dew, which is to be of a fine red colour. Large melons are not to be coveted, but firm and well-flavoured ones. Our gardeners who raife melons for fale, fow the feeds of the larger rather than the good kinds, and they increafe the fize of thefe by much watering the roots; but this fpoils the tafte. Some of the French raife at this time particularly fine melons, by a method kept as a fecret, but which we find, on a ftrict inquiry, is no other than the ingenious Mr Quintiny's of that nation, publifhed near 80 years ago in our Philofophical Tranfactions

The melons particularly proper to be treated in this manner, are thofe which have a thin and fomewhat embroidered fkin, not divided by ribs, and have a red pulp, dry and melting on the tongue, not mealy, and of a high flavour. Thefe are what fucceed in the following method, and are greatly improved in fize and flavour by it.

When the feeds of this melon are placed in the ground, the firft thing that appears is a pair of feminal leaves, or *ears*, as the gardeners call them. Between thefe two leaves there fhoots, fome days after, a leaf called the *firft leaf* or *knot;* and out of the fame place, after fome days more, there fhoots another leaf, called the *fecond knot.* Out of the midft of this ftalk of the fecond knot, there fhoots a third knot; this third knot muft be cut off at its infertion, without hurting the branch of the fecond knot from whence it grows. Out of this place there will grow, after this cutting, a branch, which will be what the gardeners call the *firft arm;* and this arm will, in the fame manner as the firft plant, fhoot out, firft one, then a fecond, and then a third knot; this third knot muft be cut again as before, and thus the third knots are all along to be cut off, and arms or branches will grow up in the places of them all the way in the fame manner as the firft; and it is at thofe arms that the melons will be produced, and they will be always good, if the foot or root be well nourifhed in good earth, and cherifhed by a good hot-bed and the fun. The foot of the melon muft never be fuffered to pafs into the dung, and the earth muft not be watered but moderately, when it is feen to grow too dry; but in this cafe, it muft be moderately moiftened in time, left the fhoot fuffer by it. Twice or thrice a-week is often enough to water in the drieft weather, and this muft always be done about funfet; and when the heat of the fun is too violent, the melons muft be covered with ftraw mats from 11 in the morning to about two in the afternoon. When it rains much, the melons muft alfo be covered, left it hurt them by too much moifture. (Philofoph. Tranf. n° 4[illegible].)—If the root produce too many branches, the weakeft are to be cut off, and only three or four left; and thofe which are left are to be fuch as have their knots clofeft to one another. When the plants are removed from the feed-bed to the places where they are to ftand, if they are very ftrong, they fhould be planted fingle; but if otherwife, two are to be fet in each hole

When they are planted fingle, the two branches, which always grow on each fide from the bafe of the feed leaves, are to be left on; but when two plants are fet together, thefe branches are to be cut off, otherwife all the branches will be too numerous, and they will entangle and fpoil one another.

When the melons are knit, two of them only are to be left upon each foot, choofing thofe which are beft placed, and next to the firft and principal ftalk, that is, to the heart of the foot. None but fair fruits are to be left, and fuch as have a thick and fhort tail; and the foot of the melon muft be fhort, well truffed, and not far diftant from the ground. Melons of a long ftem, and having the ftalk of the leaf too long and flender, are never vigorous. All the fuperfluous branches muft be cut off from time to time, as they fhoot out. There fometimes fhoot out a branch more than is here mentioned, between the two feed-leaves or ears. If this is ftrong and vigorous, it is to be kept on, but if weakly, it is beft to take it off, for it will never bear good fruit.

Water-Melon. See ANGURIA.

MELOS, (anc. geog.), an ifland between Crete and Peloponnefus, about 24 miles from Scyllæum. It is about 60 miles in circumference, and of an oblong figure. It enjoyed its independence for above 700 years before the time of the Peloponnefian war. This ifland was originally peopled by a Lacedemonian colony, 1116 years before the Chriftian era. For this reafon the inhabitants refufed to join the reft of the iflands and the Athenians againft the Peloponnefians. This refufal was feverely punifhed. The Athenians took Melos, and put to the fword all fuch as were able to bear arms. The women and children were made flaves, and the ifland left defolate. An Athenian colony repeopled it, till Lyfander reconquered it and re-eftablifhed the original inhabitants in their poffeffions.

MELOTHRIA, in botany: A genus of the monogynia order, belonging to the triandria clafs of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ.* The calyx is quinquefid; the corolla campanulated and monopetalous; the berry trilocular and monofpermous. There is only one fpecies, viz. the pendula, a native of Carolina, Virginia, and alfo many of the American iflands. The plants ftrike out roots at every joint, which faften themfelves into the ground, by which means their ftalks extend to a great diftance each way The flowers are very fmall, in fhape like thofe of the melon, of a pale fulphur colour. The fruit in the Weft Indies grows to the fize of a pea, is of an oval figure, and changes to black when ripe: thefe are by the inhabitants fometimes pickled when they are green. In Britain the fruit are much fmaller, and are fo hidden by the leaves that it is difficult to find them. The plants are too tender to be reared in this country without artificial heat

MELPOMENE (fab. hift.), one of the mufes, daughter of Jupiter and Mnemofyne. She prefided over tragedy. Horace has addreffed the fineft of his odes to her, as to the patronefs of lyric poetry. She was generally reprefented as a young woman with a ferious countenance Her garments were fplendid; fhe wore a bufkin, and held a dagger in one hand and in the other a fceptre and crown.

MELROSE, a town of Scotland, in the county of Selkirk, and on the confines of Tweeddale, feated seated on the south side of the river Tweed; with an ancient abbey now in ruins. W. Long. 2. 32. N. Lat. 55. 3-.

This abbey was founded by king David I in 1136. He peopled it with Cistertians brought from Rivale abbey in Yorkshire, and dedicated it to the Virgin Mary. At the reformation James Douglas was appointed commendator, who took down much of the building, in order to furnish materials for a large house to himself, which still remains, and is dated 1590. Nothing is left of the abbey excepting a part of the cloister walls elegantly carved; but the ruins of the church are of most uncommon beauty. Part is at present used for divine service, the rest uncovered; but every part does great honour to the architect.—Alexander II. was buried beneath the great altar, and it is also the place of interment of the Douglases and other potent families.—Its situation is extremely pleasant.

MELT OF FISHES. In the melt of a living cod there are such numbers of those animalcules said to be found in the semen of all male animals, that in a drop of its juice no larger than a grain of sand, there are contained more than 10,000 of them; and considering how many such quantities there are in the whole melt of one such fish, it is not incredible, that there are more animals in one melt of it than there are living men at one time upon the face of the earth. However strange and romantic such a conjecture must appear, a serious consideration and calculation will make it appear very plain. An hundred such grains of sand as those just mentioned will make about an inch in length; therefore in a cubic inch there will be a million of such sands; and if there be 10,000 animals in each of those quantities, there must be in the whole 150,000 millions, which is a number vastly exceeding that of mankind, even supposing the whole as populous as Holland.

MELTING CONE, in essaying, an hollow cone of brass or cast iron, into which melted metalline substances are thrown, in order to free them from their scoriæ. When a small quantity of matter is melted, it will be sufficient to rub the inside of the cone with grease; but when the quantity is very large, especially if it contains any thing sulphureous, this caution of tallowing the moulds is not sufficient. In this case the essayer has recourse to a lute reduced to thin pap with water, which effectually prevents any injury to the cone.

MELTON-MOUBRAY, a town of Leicestershire, 108 miles from London. It is a large built place, in a fertile soil; with a market on Tuesday, the most considerable for cattle of any in this part of the island. It is almost encompassed with a little river called the *Eye*, over which it has two fine bridges; and has a large handsome church, with a free school. Here are frequent horse-races, and three fairs in the year.

MELVIL (Sir James), descended from an honourable Scots family, being the third son of the laird of Kaeth, was born about the middle of the 16th century. He went to France very young, in the capacity of page to Queen Mary, then married to the dauphin; and on the death of her husband, followed her to Scotland, where he was made gentleman of her chamber, and admitted a privy-counsellor. She employed him in her most important concerns, till her unhappy confinement in Lochleven, all which he discharged with the utmost fidelity; and, from his own accounts, there is reason to conclude, that, had she taken his advice, she might have avoided many of her misfortunes. When she was prisoner in England, she recommended him strongly to her son James; with whom he continued in favour and employment until the death of Queen Elizabeth: James would then have taken him to England; but Melvil, now grown old, was desirous of retiring from business, and in his retirement he drew up the memoirs of his past life for the use of his son. These Memoirs were accidentally found in Edinburgh castle in the year 1660, though nobody knew how they came to be deposited there; and were published in folio in 1683.

MEMBERS, in anatomy, the exterior parts, arising from the trunk or body of an animal, like the boughs from the trunk of a tree.

MEMBER, in architecture, denotes any part of a building; as a frieze, cornice, or the like.

MEMBER is sometimes also used for moulding.

MEMBER, in grammar, is applied to the parts of a period or sentence.

MEMBER, is also used to denote some particular order or rank in a state or government: thus we say, "member of a corporation, member of parliament, member of the council," &c.

MEMBRANE, MEMBRANA, in anatomy, a similar part of an animal body; being a thin, white, flexible, expanded skin, formed of several sorts of fibres interwoven together, and serving to cover or wrap up certain parts of the body. See ANATOMY *passim*.

MEMEL, or MEMMEL; a town of Prussia, situated on the northern extremity of the Curische Haf, an inlet of the sea about 70 miles in length, which is here joined to the Baltic by a narrow strait.—It is an ill-built town, with narrow dirty streets; but remarkable for its extensive commerce, being provided with the finest harbour in the Baltic. In 1784, 996 ships, amongst which were 500 English, arrived here. The imports chiefly are, salt, iron, and salted herrings; the exports, which greatly exceed the imports, are amber, corn, hemp, flax, and particularly timber. An English consul resides here. The trade is daily increasing, on account of the high duties which the court of Russia has laid on the imports of Riga

MEMNON (fab. hist.), a king of Ethiopia, son of Tithonus and Aurora. He came with a body of 10,000 men to assist his uncle Priam, during the Trojan war. He behaved with great courage, and killed Antilochus, Nestor's son. The aged father challenged the Ethiopian monarch; but Memnon refused it on account of the venerable age of Nestor, and accepted that of Achilles. He was killed in the combat, in the sight of the Grecian and Trojan armies. Aurora prayed Jupiter to grant her son such honours as might distinguish him from other mortals. The god consented; and immediately a numerous flight of birds issued from the burning pile on which the body was laid, and dividing themselves into two separate bodies, fought with such fury, that above half of them fell down in the fire as victims to appease the manes of Memnon.

These birds were called *Memnonides*; and it has been observed by some of the ancients, that they never failed to return yearly to the tomb of Memnon in Troas, and repeat the same bloody engagement in honour of the hero from whom they received their name. The Ethiopians or Egyptians, over whom Memnon reigned, erected a celebrated statue to the honour of their monarch. This statue had the wonderful property of uttering a melodious sound every day at sunrising like that which was heard at the breaking of the string of a harp when it is wound up. This was effected by the rays of the sun when they fell upon it. At the setting of the sun, and in the night, the sound was lugubrious. This is supported by the testimony of the geographer Strabo, who confesses himself ignorant whether it proceeded from the basis of the statue, or the people that were then around it. This celebrated statue was dismantled by order of Cambyses when he conquered Egypt; and its ruins still astonish modern travellers by their grandeur and beauty.

Memnon of Rhodes, one of the generals of Darius king of Persia, advised that prince to lay waste the country, in order to deprive Alexander the Great's army of support, and afterwards to attack Macedon; but this counsel was disapproved by Darius's other generals. Memnon behaved at the passage of the Granicus like an experienced general. He afterwards defended the city of Miletum with great courage; seized the islands of Chio and Lesbos; spread terror throughout all Greece; and would have put a stop to the conquests of Alexander, if he had not been prevented by death. Barsina, Memnon's widow, was taken prisoner with Darius's wife, and Alexander had a son by her named *Hercules*.

MEMOIRS, in matters of literature, a species of history, written by persons who had some share in the transactions they relate; answering to what the Romans called *Commentarii*. The journals of the proceedings of a literary society, or a collection of matters transacted therein, are likewise called *Memoirs*.

MEMORY, a faculty of the mind, which presents to us ideas or notions of what is past, accompanied with a persuasion that the things themselves were formerly real and present. What we distinctly remember to have perceived, we as firmly believe to have happened, as what is now present to our senses.

The opinions of philosophers concerning the means by which the mind retains the ideas of past objects, and how those ideas carry with them evidence of their objects having been actually perceived, shall be laid before our readers in another place: (see METAPHYSICS, Part I. chap ii.) At present we shall throw together some observations on the Memory, which, being of a practical rather than of a speculative nature, cannot be admitted into the article where the nature of the faculty itself is discussed.

"When we remember with little or no effort, it is called *remembrance* simply, or *memory*, and sometimes *passive memory* *. When we endeavour to remember what does not immediately and (as it were) of itself occur, it is called *active memory*, or *recollection*. A ready recollection of our knowledge, at the moment when we have occasion for it, is a talent of the greatest importance. The man possessed of it seldom fails to distinguish himself in whatever sort of business he may be engaged." It is indeed evident, that when the power of retention is weak, all attempts at eminence of knowledge must be vain; for "memory is the primary and fundamental power †, without which there could be no other intellectual operation. Judgment and ratiocination suppose something already known, and draw their decisions only from experience. Imagination selects ideas from the treasures of remembrance, and produces novelty only by varied combinations. We do not even form conjectures of distant, or anticipations of future, events, but by concluding what is possible from what is past."

Of a faculty so important, many rules have been given for the regulation and improvement; of which the first is, that he who wishes to have a clear and distinct remembrance, should be temperate with respect to eating, drinking, and sleep. The memory depends very much upon the state of the brain; and therefore whatever is hurtful to the latter, must be prejudicial to the former. Too much sleep clouds the brain, and too little overheats it; therefore either of these extremes must of course hurt the memory, and ought carefully to be avoided. Intemperance of all kinds, and excess of passion, have the same ill effects; so that we rarely meet with an intemperate person whose memory is at once clear and tenacious.

"The liveliest remembrance is not so vivid as the sensation that produced it ‡; and ideas of memory do often, but not always, decay more and more, as the original sensation becomes more and more remote in time. Those sensations and those thoughts have a chance to be long remembered which are lively at first; and those are likely to be most lively which are most attended to, or which are accompanied with pleasure or pain, with wonder, surprise, curiosity, merriment, and other lively passions. The art of memory, therefore, is little more than the art of attention. What we wish to remember we should attend to, so as to understand it perfectly, fixing our view particularly upon its importance or singular nature, that it may raise within us some of the passions above-mentioned. We should also disengage our minds from all other things, that we may attend more effectually to the object which we wish to remember. No man will read with much advantage who is not able at pleasure to evacuate his mind, or who brings not to his author an intellect defecated and pure, neither turbid with care, nor agitated with pleasure. If the repositories of thought are already full, what can they receive? If the mind is employed on the past or the future, the book will be held before the eyes in vain.

"It is the practice of many readers, to note in the margin of their books the most important passages *, the strongest arguments, or the brightest sentiments. Thus they load their minds with superfluous attention, repress the vehemence of curiosity by useless deliberation, and by frequent interruption break the current of narration or the chain of reason, and at last close the volume and forget the passages and the marks together. Others are firmly persuaded, that nothing is certainly remembered but what is transcribed; and they, therefore, pass weeks and months in transferring large quotations to a common place-book. Yet, why any part of a book which can be consulted

Memory.

* Beattie's Moral Science.

† Idler.

‡ Beattie's Elements, &c. and Idler.

* Elements of Moral Science.

Memory. confulted at pleafure fhould be copied, we are not able to difcover. The hand has no clofer correfpondence with the memory than the eye. The act of writing itfelf diftracts the thoughts; and what is read twice, is commonly better remembered than what is tranfcribed. This method, therefore, confumes time, without affifting the memory. But to write an abridgement of a good book may fometimes be a very profitable exercife. In general, when we would preferve the doctrines, fentiments, or facts, that occur in reading, it will be prudent to lay the book afide, and put them in writing in our own words. This practice will give accuracy to our knowledge, accuftom us to recollection, improve us in the ufe of language, and enable us fo thoroughly to comprehend the thoughts of other men, as to make them in fome meafure our own."

"Our thoughts have for the moft part a connection *; fo that the thought which is juft now in the mind, depends partly upon that which went before, and partly ferves to introduce that which follows. Hence we remember beft thofe things of which the parts are methodically difpofed and mutually connected. A regular difcourfe makes a more lafting impreffion upon the hearer than a parcel of detached fentences, and gives to his rational powers a more falutary exercife: and this may fhow us the propriety of conducting our ftudies, and all our affairs, according to a regular plan or method. When this is not done, our thoughts and our bufinefs, efpecially if in any degree complex, foon run into confufion."

* *Idler.*

As the mind is not at all times equally difpofed for the exercife of this faculty, fuch feafons fhould be made choice of as are moft proper for it. The mind is feldom fit for attention prefently after meals; and to call off the fpirits at fuch times from their proper employment in digeftion, is apt to cloud the brain, and prejudice the health. Both the mind and body fhould be eafy and undifturbed when we engage in this exercife, and therefore retirement is moft fit for it: and the evening, juft before we go to reft, is generally recommended as a very convenient feafon, both for the ftillnefs of the night, and becaufe the impreffions will then have a longer time to fettle before they come to be difturbed by the acceffion of others proceeding from external objects; and to call over in the morning what has been committed to the memory over-night, muft, for the fame reafon, be very ferviceable. For, to review thofe ideas while they continue frefh upon the mind, and unmixed with any others, muft neceffarily imprint them more deeply.

Some ancient writers fpeak of an artificial memory, and lay down rules for attaining it. Simonides the poet is faid firft to have difcovered this, or at leaft to have given the occafion for it. The ftory they tell of him is this: Being once at a feaft, he recited a poem which he had made in honour of the perfon who gave the entertainment. But having (as is ufual in poetry) made a large digreffion in praife of Caftor and Pollux; when he had repeated the whole poem, his patron would give him but half the fum he had promifed, telling him he muft get the other part from thofe deities who had an equal fhare in the honour of his performance. Immediately after, Simonides was told that two young men were without, and muft needs fpeak with him. He had fcarce got out of the houfe, when the room where the company was fell down, killed all the perfons in it, and fo marfhed the bodies, that, when the rubbifh was thrown off, they could not be known one from another: upon which Simonides recollecting the place where every one had fat, by that means diftinguifhed them. Hence it came to be obferved, that to fix a number of places in the mind in a certain order, was a help to the memory: As we find by experience, that, upon returning to places once familiar to us, we not only remember them, but likewife many things we both faid and did in them. This action therefore of Simonides was afterward improved into an art; and the nature of it is this: They bid you form in your mind the idea of fome large place or building, which you may divide into a great number of diftinct parts, ranged and difpofed in a certain order. Thefe you are frequently to revolve in your thoughts, till you are able to run them over one after another without hefitation, beginning at any part. Then you are to imprefs upon your mind as many images of living creatures, or any other fenfible objects which are moft likely to affect you, and be fooneft revived in your memory. Thefe, like characters in fhort-hand, or hieroglyphics, muft ftand to denote an equal number of other words, which cannot fo eafily be remembered. When therefore you have a number of things to commit to memory in a certain order, all that you have to do is, to place thefe images regularly in the feveral parts of your building. And thus they tell you, that, by going over feveral parts of the building, the images placed in them will be revived in the mind; which of courfe will give you the things or words themfelves in the order you defire to remember them. The advantage of the images feems to be this; that, as they are more like to affect the imagination than the words for which they ftand, they will for that reafon be more eafily remembered. Thus, for inftance, if the image of a *lion* be made to fignify *ftrength*, and this word *ftrength* be one of thofe I am to remember, and is placed in the porch; when, in going over the feveral parts of the building, I come to the porch, I fhall fooner be reminded of that image than of the word *ftrength*. Of this artificial memory, both Cicero and Quintilian fpeak; but we know not of any modern orator that has ever made ufe of it. It feems indeed to have been a laborious way of improving the memory, if it ferves that end at all, and fitter for affifting us to remember any number of unconnected words than a continual difcourfe, unlefs fo far as the remembrance of one word may enable us to recollect more. It is, however, in allufion to it, that we ftill call the parts of a difcourfe *places* or *topics*, and fay, *in the firft place*, *in the fecond place*, &c.

But, doubtlefs, the moft effectual way to gain a good memory, is by conftant and moderate exercife of it; for the memory, like other habits, is ftrengthened and improved by daily ufe. It is indeed hardly credible, to what a degree both active and paffive remembrance may be improved by long practice. *Scaliger* reports of himfelf, that in his youth he could repeat

Memory, Memphis. peat above 100 verses, having once read them; and *Berthicus* declares, that he wrote his *Comment upon Claudian* without consulting the text. To hope, however, for such degrees of memory as these, would be equally vain as to hope for the strength of *Hercules*, or the swiftness of *Achilles*. "But there are clergymen who can get a sermon by heart § in two hours, though their memory, when they began to exercise it, was rather weak than strong: And pleaders, with other orators who speak in public and *extempore*, often discover, in calling instantly to mind all the knowledge necessary on the present occasion, and every thing of importance that may have been advanced in the course of a long debate, such powers of retention and recollection as, to the man who has never been obliged to exert himself in the same manner, are altogether astonishing. As habits, in order to be strong, must be formed in early life, the memories of children should therefore be constantly exercised; but to oblige them to commit to memory what they do not understand, perverts their faculties, and gives them a dislike to learning." In a word, those who have most occasion for memory, as orators and public speakers, should not suffer it to lie idle, but constantly employ it in treasuring up and frequently reviving such things as may be of most importance to them; for by these means, it will be more at their command, and they may place greater confidence in it upon any emergency."

§ Idler.

"Men complain of nothing more frequently than of deficient memory ‡: and indeed every one finds, that after all his efforts many of the ideas which he desired to retain have slipped irretrievably away; that acquisitions of the mind are sometimes equally fugitive with the gifts of fortune; and that a short intermission of attention more certainly lessens knowledge than impairs an estate. To assist this weakness of our nature, many methods besides those which we have mentioned have been proposed; all of which may be justly suspected of being ineffectual: for no art of memory, however its effects may have been boasted or admired, has been ever adopted into general use; nor have those who possessed it appeared to excel others in readiness of recollection or multiplicity of attainments." The reader who is desirous to try the effect of those helps, may have recourse to a treatise entitled *A new Method of Artificial Memory*; but the true method of memory is attention and exercise.

‡ Elements of Moral Science.

MEMPHIS, an ancient city, and the royal residence of the kings in the Higher Egypt; distant from the Delta to the south 15 miles, according to Pliny. Called also *Moph* and *Noph*, in scripture.

Though this city is now so completely ruined, that authors greatly disagree concerning its situation; yet Strabo informs that in his time it was the most magnificent in Egypt, next to Alexandria. It was called the capital of the country; and there was an entire temple of Osiris, where the Apis or sacred ox was kept and worshipped. In the same place was an apartment of the mother of the ox; a very magnificent temple of Vulcan; a large Circus or space for fighting bulls; and a great Colossus in the middle of the city, which was thrown down. There was likewise a temple of Venus, and a Serapium in a very sandy place, where the wind heaps up hills of sand very dangerous to travellers; together with a number of Sphinxes, the heads of some of them only being visible, the others covered up to the middle of their body. The same author likewise informs us, that in the front of the city there were many lakes; and that it contained a number of palaces, at that time in ruins. These buildings, he said, formerly stood upon an eminence: they lay along the side of the hill, stretching down to the lakes and groves, 40 stadia from the city. There was likewise a mountain in the neighbourhood, on which were a great number of pyramids, with the sepulchres of the kings, among which were three remarkable, and two of them accounted wonders of the world. From this description, Mr Bruce concludes that the celebrated capital of Egypt stood in the place where the villages of Metrahenny are now situated; in opposition to Dr Shaw's opinion, who thinks it was situated at Geeza or Gisa.

M Savary has also shown, that Gisa was not the situation of the ancient Memphis. This stood, he says, on the western bank of the Nile, on the spot where the village of Memph now stands, which still preserves the name. Large heaps of rubbish are still to be seen there; but the Arabs have transported to Cairo the columns and remarkable stones, which they have disposed, without taste and without order, in their mosques and public buildings. This city extended as far as Saccara; and was almost wholly encompassed by lakes, part of which are still subsisting. It was necessary to cross them to convey the dead to the sepulchre of their fathers. The tombs, hewn out of the rock, were closed up with stones of a proportionable size, and covered with sand. These bodies, embalmed with so much care, preserved with so much respect, are torn from the monuments they repose in, and sold without decency to strangers by the inhabitants of Saccara. This place is called *the plain of mummies*. There too we find *the well of the birds*, into which one descends by means of a rope. It leads to subterraneous galleries, filled with earthen vases, containing the sacred birds. They are rarely met with entire, because the Arabs break them in hopes of finding idols of gold. They do not conduct travellers into the places where they have found more precious articles. They even close them up carefully, reserving to themselves some secret passages by which they descend. In a journey into Egypt made by the duke de Chaulnes, he advanced very far into these winding labyrinths, sometimes crawling, and sometimes scrambling, on his knees. Informed by Mr Edward Wortley Montague, who has carefully visited Egypt, he arrived at one of those passages which had an opening shut up from without by branches of the date-tree interwoven, and covered with sand. He remarked there some hieroglyphics *in relievo*, executed in the highest perfection. But the Arabs resisted every offer he made them to permit him to take drawings of them, or to mold them, in order to preserve their form. The duke de Chaulnes is of opinion that these hieroglyphics, sculptured with so much art that the objects they represent may be discovered at the first sight, might possibly furnish the key of the others, whose contours are simply expressed, and form a sort of alphabet of this unintelligible language. Several pyramids are distinguishable

guishable along the mountains which bound Saccara on the west, the greatest part of which appear as lofty as those of Gisa. See PYRAMIDS.

MENAGE (Fr.), denotes a collection of animals; whence we have derived the word *menagery*.

MENAGE (Giles), in Latin *Ægidius*, a celebrated French writer, born at Angers in 1613. He finished his studies in that city, was made advocate, and pleaded for some time at Angers, Paris, and Poictiers; but, becoming at length disgusted with the bar, turned ecclesiastic, and gave himself up entirely to the study of polite literature. He at length entered into the family of the cardinal de Retz; but disagreeing with some persons belonging to his Eminence, went to live in the cloyster of Notre Dame, where he held an assembly of learned men every Wednesday. He read a great deal; had a prodigious memory; and was incessantly quoting in his conversation verses in Greek, Latin, Italian, French, &c. on which account he was often turned into ridicule by the wits, especially towards the end of his days. His great memory he retained even in his old age; and what is very rare, it returned to him after some interruption. The reputation of his works procured him a place in the academy *della Crusca* at Florence He might have been a member of the French academy at its first institution, if it had not been for his *Requeste des Dictionnaires*: but when that was forgot, he was proposed in 1684 to fill up a vacant place in that academy, and was excluded only by the superior interest of his competitor Mr Bergent; for there was not one member of all those who gave their votes against them, but owned that he deserved the place. He would not suffer his friends to propose him again. He died at Paris in 1692, aged 79. He wrote a great number of books in prose and verse; the principal of which are, 1. Miscellaneous works. 2. The Origin of the French Language. 3. The Origin of the Italian Tongue; the best edition of which is that of Geneva, in 1685, folio. 4. An edition of Malherbe's Poems, with Notes. 5. An edition of Diogenes Laertius, with Observations. 6 Remarks on the French Tongue. 7. Greek, Latin, Italian, and French Poems.

MENANDER, an ancient Greek poet, was born at Athens in the same year with Epicurus, which was the third of the 109th Olympiad. His happiness in introducing the new comedy, and refining an art which had been so gross and licentious in former times, quickly spread his name over the world. Pliny informs us, that the kings of Egypt and Macedon gave a noble testimony of his merit, by sending ambassadors to invite him to their courts, and even fleets to bring him over; but that Menander was so much of a philosopher, as to prefer the free enjoyment of his studies to the promised favours of the great. Of his works, which amounted to above 100 comedies, we have had a double loss, the originals being not only vanished, but the greatest part of them, when copied by Terence, having unfortunately perished by shipwreck before they saw Rome. Yet the four plays which Terence borrowed from him before that accident happened, are still preserved in the Roman habit; and it is chiefly from Terence that most people form their judgment of Menander, the fragments that remain of him not being sufficient to enable them to do it. The ancients have said high things of Menander; and we find the old masters of rhetoric recommending his works as the true patterns of every beauty and every grace of public speaking. Quintilian declares, that a careful imitation of Menander only, will satisfy all the rules he has laid down in his Institutions. It is in Menander that he would have his orator search for a copiousness of invention, for a happy elegance of expression, and especially for that universal genius which is able to accommodate itself to persons, things, and affections.— But Julius Cesar has left the loftiest as well as the justest praise of Menander's works, when he calls Terence only a *Half-Menander*. For while the virtues of the Latin poet are so deservedly admired, it is impossible we should raise a higher notion of excellency than to conceive the great original still shining with half its lustre unreflected, and preserving an equal part of its graces, above the power of the best copier in the world. Menander died in the 3d year of the 122d Olympiad, as we are taught by the same old inscription from which we learn the time of his birth. His tomb, in Pausanias's age, was to be seen at Athens, in the way from the Piræus to the city, close by the honorary monument of Euripides. Quintilian, in his judgement of Afranius the Roman comedian, who imitated him, censures Menander's morals as much as he commends his writings; and his character, according to Suidas, is, that he was a very "mad fellow after women." Phædrus has given him the gait and dress of a most affected fop:

> "Unguento delibutus, vestitu adfluens,
> "Veniebat gressu delicatulo & languido."
>
> *Lib.* v. fab. 2.

MENANDRIANS, the most ancient branch of Gnostics; thus called from Menander their chief, said by some, without sufficient foundation, to have been a disciple of Simon Magus, and himself a reputed magician.

He taught, that no person could be saved, unless he were baptised in his name: and he conferred a peculiar sort of baptism, which would render those who received it immortal in the next world: exhibiting himself to the world, with the phrensy of a lunatic more than the founder of a sect, as a promised saviour. For it appears by the testimonies of Irenæus, Justin, and Tertullian, that he pretended to be one of the Æons sent from the pleroma, or ecclesiastical regions, to succour the souls that lay groaning under bodily oppression and servitude; and to maintain them against the violence and stratagems of the dæmons that hold the reins of empire in this sublunary world. As this doctrine was built upon the same foundation with that of Simon Magus, the ancient writers looked upon him as the instructor of *Menander*. See SIMONIANS.

MENASSEH (Ben Israel), a celebrated rabbi, born in Portugal about the year 1604, was the son of Joseph Ben Israel, and followed his father into Holland. Here he was educated by rabbi Isaac Uziel, under whom he in a short time made such progress in the Hebrew tongue, that at 18 years of age he succeeded him in the synagogue of Amsterdam. In this post he continued several years, and married Rachel of the

the family of the Abarbanels, whom the Jews imagine to be descended from king David. He afterwards went to his brother Ephraim, a rich merchant, who had settled at Basil; by whose advice he entered into trade. Some time after, the hopes of a more agreeable settlement induced him to come into England, under the protectorship of Cromwell; who gave him a very favourable reception, and one day entertained him at his table with several other learned divines. However, he soon after passed into Zealand; and died at Middleburg about the year 1657. The Jews at Amsterdam obtained his body, and interred it at their expence. He was of the sect of the Pharisees; had a lively wit, a solid judgement, great learning, and all the virtues that can adorn private life. He wrote many works in Hebrew, Latin, Spanish, and English. The principal of those published in Latin, are, 1. His *Conciliator*; a learned and curious work, in which he reconciles those passages of Scripture which seem to contradict each other. 2. *De resurrectione mortuorum*. 3. *De termino vitæ*. 4. *Dissertatio de fragilitate humana, ex lapsu Adami, deque Divino in bono opere auxilio*. 5. *Spes Israel*. Dr Thomas Pococke has written his life in English.

MENCKE (Lewis Otto), in Latin *Menckenius*, a learned professor of morality at Leipsic, was born at Oldenburg in Westphalia in 1644. He studied in several universities of Germany; and became an able philosopher, civilian, and divine. He was made professor of morality at Leipsic in 1668; and enjoyed that post to his death. He was five times rector of the university of that city, and seven times dean of the faculty of philosophy. He published several works; but his most considerable, and what alone is sufficient to perpetuate his memory, is the *Acta Eruditorum* of Leipsic, of which he was the first author, and in which he was engaged till his death. The first volume was published at Leipsic, in 4to, in 1682.

Mencke (John Burchard), son to the preceding. After his studies he travelled into England and Holland; and upon his return was appointed professor of history at Leipsic in 1699. He gained great reputation by his lectures as well as his writings. He died in 1732, aged 58. He wrote many pieces. His *De Charlataneria eruditorum declamationes duæ*, is an excellent satire, designed to expose the artifices used by false scholars to raise themselves a name. As he named and pointed at certain persons, it exasperated them, and they procured his book to be seized; but it spread, and editions of it were multiplied. He likewise published *Methodé pour etudier l'Histoire, avec un catalogue des principaux historiens*, &c. He made a great many additions to Mr Lenglet's book, especially with regard to the German historians.

MENDELSHON (Moses), that is, *Moses the son of Mendel*, a Jew of Berlin, and one of the most celebrated writers in Germany, died there in the year 1785 at the age of 57. His first attempt as an author was in 1755, by a work intitled *Jerusalem*; in which, besides other bold and unjustifiable opinions, he maintains, that the Jews have a revealed law but not a revealed religion; that opinions are not subjects of revelation; and that the only religion of the Jewish nation is that of nature. He acquired great honour by his *Phedon*, or "Discourse on the Immateriality and Immortality of the Soul," translated into French 1773, 8vo; in which he unfolds this important truth, the great foundation of all morality, with the wisdom of an enlightened philosopher and the charms of an elegant writer. In consequence of this excellent work, he was styled the *Jewish Socrates* by some of the periodical writers; but he wanted the firmness and courage of the Grecian philosopher. His timidity, and even pusillanimity, defects too common in speculative men, prevented him from being of any essential service to his nation; of which he might have become the benefactor by being the reformer. The pliancy of his character, his soft, modest, and obliging disposition, gained him the esteem alike of the superstitious and of the incredulous. After all, he could never procure admission to the Berlin society, or to the conversation of the king of Prussia. At his death he received from his nation those honours which are commonly paid to their first rabbins. Contrary to an imprudnt custom prevalent among the Jews of burying their dead before sunset, his interment was delayed till 24 hours after he expired. Though Mendelshon was descended from a respectable family, he was very poor. In early life he entered into a counting-house of his own nation, wherein he greatly recommended himself by his capacity and integrity in business: But philosophy and literature soon became his principal occupation; and to the famous Lessing he was indebted for counsels which, without diverting his attention from those pursuits that were necessary to his subsistence, accelerated his progress in his literary career. Even after the death of his benefactor, Mendelshon retained for him the sincerest regard and the most lively gratitude. Notwithstanding the very strict regimen which he observed, he survived him only a few years; for his feeble frame and weak constitution were gradually and insensibly undermined by intense application to study.

MENDEZ Pinto (Ferdinand), was born at Montemor-o-velho in Portugal, and was at first servant to a Portuguese gentleman. In expectation of making a fortune, he embarked for India in 1537. His vessel being taken by the Turks on his passage, he was carried to Mocka, and sold to a Greek renegado, and afterwards to a Jew, in whose possession he continued till he was redeemed by the governor of Ormus, a Portuguese fort. The governor procured him an opportunity of going out to India, agreeable to his first design. During a residence of twenty-one years in that country, he was witness to very important transactions, and experienced many singular adventures. He returned to Portugal in 1558, where he enjoyed the reward of his labours, after having been thirteen times a slave and sixteen times sold. A very curious account of his travels was written by himself, and published at Lisbon, A. D. 1614, in folio. This work was translated into French by Bernard Figuier, a Portuguese gentleman, and printed at Paris 1645, in 4to. It is written in a very interesting manner, and in a style more elegant than might have been expected from a man whose whole life was spent in the camp and in slavery. It elucidates a great variety of particulars relating to the geography, history, and manners of the inhabitants of China, Japan, Pegu, Siam, Achem, Java, &c. Many of his facts appeared fabulous, but their truth has been since ascertained.

Mendicants.

M. de Surgi compiled an interefting hiftory from the moft fingular facts in Mendez Pinto's relation, which he publifhed in the *Viciffitudes de la Fortune*, Paris, 2 vols, 8vo.

MENDICANTS, or BEGGING FRIARS, feveral orders of religious in Popifh countries, who having no fettled revenues, are fupported by the charitable contributions they receive from others.

This fort of fociety began in the 13th century; and the members of it, by the tenor of their inftitution, were to remain entirely deftitute of all fixed revenues and poffeffions; though in procefs of time their number became a heavy tax upon the people. Innocent III. was the firft of the popes who perceived the neceffity of inftituting fuch an order; and accordingly he gave fuch monaftic focieties, as made a profeffion of poverty, the moft diftinguifhing marks of his protection and favour. They were alfo encouraged and patronized by the fucceeding pontiffs, when experience had demonftrated their public and extenfive ufefulnefs. But when it became generally known, that they had fuch a peculiar place in the efteem and protection of the rulers of the church, their number grew to fuch an enormous and unwieldy multitude, and fwarmed fo prodigioufly in all the European provinces, that they became a burden, not only to the people, but to the church itfelf. The great inconvenience that arofe from the exceffive multiplication of the mendicant orders was remedied by Gregory X. in a general council, which he affembled at Lyons in 1272. For here all the religious orders that had fprung up after the council held at Rome in 1215, under the potificate of Innocent III. were fuppreffed; and the extravagant multitude of mendicants, as Gregory called them, were reduced to a fmaller number, and confined to the four following focieties or denominations, viz. the DOMINICANS, the FRANCISCANS, the CARMELITES, and the AUGUSTINS or hermits of St Auguftin.

As the pontiffs allowed thefe four mendicant orders the liberty of travelling wherever they thought proper, of converfing with perfons of every rank, of inftructing the youth and multitude wherever they went; and as thofe monks exhibited, in their outward appearance and manner of life, more ftriking marks of gravity and holinefs than were obfervable in the other monaftic focieties, they arofe all at once to the very fummit of fame, and were regarded with the utmoft efteem and veneration through all the countries of Europe. The enthufiaftic attachment to thefe fanctimonious beggars went fo far, that, as we learn from the moft authentic records, feveral cities were divided or cantoned out into four parts, with a view to thefe four orders; the firft part being affigned to the Dominicans, the fecond to the Francifcans, the third to the Carmelites, and the fourth to the Auguftinians. The people were unwilling to receive the facraments from any other hands than thofe of the mendicants, to whofe churches they crowded to perform their devotions, while living, and were extremely defirous to depofit there alfo their remains after death: nor did the influence and credit of the mendicants end here; for we find in the hiftory of this and of the fucceeding ages, that they were employed, not only in fpiritual matters, but alfo in temporal and political affairs of the greateft confequence, in compofing the differences of princes, concluding treaties of peace, concerting alliances, prefiding in cabinet councils, governing courts, levying taxes, and other occupations, not only remote from, but abfolutely inconfiftent with, the monaftic character and profeffion. However the power of the dominicans and Francifcans greatly furpaffed that of the other two orders: infomuch that thefe two orders were, before the reformation, what the Jefuits have been fince that happy and glorious period, the very foul of the hierarchy, the engines of the ftate, the fecret fprings of all the motions of the one and the other, and the authors and directors of every great and important event, both in the religious and political world. By very quick progreffion their pride and confidence arrived at fuch a pitch, that they had the prefumption to declare publicly, that they had a divine impulfe and commiffion to illuftrate and maintain the religion of Jefus; they treated with the utmoft infolence and contempt all the different orders of the prielthood; they affirmed without a blufh, that the true method of obtaining falvation was revealed to them alone; proclaimed, with oftentation, the fuperior efficacy and virtue of their indulgencies; and vaunted beyond meafure their intereft at the court of heaven, and their familiar connections with the Supreme Being, the Virgin Mary, and the faints in glory. By thefe impious wiles, they fo deluded and captivated the miferable, and blinded the multitude, that they would not intruft any other but the mendicants with the care of their fouls. They retained their credit and influence to fuch a degree, towards the clofe of the 14th century, that great numbers of both fexes, fome in health, others in a ftate of infirmity, and others at the point of death, earneftly defired to be admitted into the Mendicant order, which they looked upon as a fure and infallible method of rendering heaven propitious. Many made it an effential part of their laft wills, that their bodies after death fhould be wrapped in old ragged Dominican or Francifcan habits, and interred among the Mendicants. For fuch was the barbarous fuperftition and wretched ignorance of this age, that people univerfally believed they fhould readily obtain mercy from Chrift, at the day of judgment, if they appeared before his tribunal affociated with the Mendicant friars.

About this time, however, they fell under an univerfal odium; but being refolutely protected againft all oppofition, whether open or fecret, by the popes, who regarded them as their beft friends and moft effectual fupports, they fuffered little or nothing from the efforts of their numerous adverfaries. In the 15th century, befides their arrogance, which was exceffive, a quarrelfome and litigious fpirit prevailed among them, and drew upon them juftly the difpleafure and indignation of many. By affording refuge at this time to the Beguins in their order, they became offenfive to the bifhops, and were hereby involved in difficulties and perplexities of various kinds. They loft their credit in the 16th century by their ruftic impudence, their ridiculous fuperftitions, their ignorance, cruelty, and brutifh manners. They difcovered the moft barbarous averfion to the arts and fciences, and expreffed a like abhorrence of certain eminent and learned men, who endeavoured to open the paths of science to the pursuits of the studious youth, recommended the culture of the mind, and attacked the barbarism of the age in their writings and discourse. Their general character, together with other circumstances, concurred to render a reformation desirable, and to accomplish this happy event.

Among the number of Mendicants are also ranked the Capuchins, Recollects, Minims, and others, who are branches or derivations from the former.

Buchannan tells us, the Mendicants in Scotland, under an appearance of beggary, lived a very luxurious life; whence one wittily called them, not *Mendicant*, but *Manducant* friars.

MENDOZA (Juan Gonzales de), an Augustan friar, of the province of Castile, was made ambassador from the king of Spain to the emperor of China. In 1593, he was made bishop of Liperi in Italy. In 1607 he was made bishop of Chiapa in New Spain, and the next year was removed to the see of Papaian in the West Indies. He wrote a history of China in Spanish, which has been translated into several languages.

MENE, a Chaldæan word, which signifies "he has numbered or counted;" being one of the three words that was written upon the wall by the hand that appeared to Belshazzar, the last king of Babylon, the night that he was put to death. See BELSHAZZAR.

MENECRATES, a physician of Syracuse, who flourished about 360 B. C. is famous for his skill in his profession, but much more for his vanity. He would always be followed by some of the patients he had cured, and with whom he previously stipulated that they should follow him wherever he went. One appeared with the attributes of Hercules, another with those of Apollo, and others again with those of Mercury or Æsculapius; while he, clad in a purple robe, with a golden crown on his head, and a sceptre in his hand, presented himself, to the admiration of the public, under the name of *Jupiter*, and travelled through different countries escorted by these counterfeit deities. He once wrote the following letter to the king of Macedon: Menecrates-Jupiter to Philip, greeting. Thou reignest in Macedonia, and I in medicine; thou givest death to those who are in good health, I restore life to the sick; thy guard is composed of Macedonians; the gods themselves constitute mine." Philip answered him in a word, that he wished him restored to reason. Learning some time after that he was in Macedon, Philip sent for him, and invited him to an entertainment. Menecrates and his companions were placed on rich and lofty couches; before which was an altar, covered with the first fruits of the harvest; and whilst an excellent repast was served up to the other guests, perfumes and libations only were offered to these new gods, who, unable to endure the affront, hastily left the palace, in which they never more made their appearance.

MENEDEMUS, a Greek philosopher, born at Erythreum, was the son of Calisthenes, and one of Phedo's followers. He was in greatest esteem, and enjoyed several important posts, in his own country. He several times defended Erythreum with great bravery, and died of grief when Antigonus became master of it. A person one day saying to him, "It is a great happiness to have what we desire," he replied, "It is a much greater to desire nothing but what we have." He flourished about 300 B. C.

MENELAUS, the son of Atreus, and the brother of Agamemnon, reigned at Sparta, when Paris deprived him of his wife Helen. This rape occasioned the famous war of Troy. See HELEN.

MENELAUS, a mathematician in the reign of the emperor Trajan, wrote three books on the *Sphere*, which have been published by father Marsenne.

MENES, born at This, a town of Thebais in Upper Egypt, was the founder of the Egyptian empire. He had three sons, viz. Athotis, who ruled after him at This and Thebes; Curudes, who in Lower Egypt founded the kingdom of Heliopoli, which afterward was the kingdom of Diospoli; and Necherophes, who reigned at Memphis. It is thought this Menes reigned 117 years after the birth of Pholeg, son of Heber, which was the very year of the dispersion of the people throughout the whole earth. In building Memphis, he stopped the Nile near it, by the invention of a causeway 100 furlongs broad, and caused it to run through the mountains.

MENESTRIER (John Baptist le), a native of Dijon, and one of the most learned and curious French antiquaries of his time, wrote, 1. A Treatise on the Medals, Money, and Ancient Monuments, of the Roman Empresses, in folio. 2. The most famous Medals of the Ancient Roman Emperors and Empresses, in quarto. He died in 1634, aged 70.

MENGS (Anthony Raphael), first painter to the king of Spain, was born at Aussig in Bohemia, A. D. 1728. His father, painter to Augustus III. king of Poland, perceiving his superior talents, carried him from Dresden to Rome in 1741. After having there pursued his art for four years, and copied the principal monuments of that capital, he returned to Dresden, where he executed different works for Augustus with very uncommon success. During his abode in Italy, he became acquainted with Don Carlos king of Naples; and when this prince succeeded to the crown of Spain in 1761, he was careful to engage Mengs in his service, by granting him an yearly pension of 2000 doubloons, together with a house and equipage. He lived, however, chiefly at Rome; where in 1779 he fell a sacrifice to his confidence in a German quack, who pretended to cure him of a disease which he had contracted partly by his intense application, and partly by grief for the loss of his wife. His natural timidity and great ignorance of the world, the distrust which seemed to be expressed in his air and manners, and his melancholy constitution of body, by no means lessened the envy of his rivals. Under this rude appearance, he had a heart full of kindness and humanity. On one occasion, when he perceived that he had offended a certain person by his bluntness (excusable only in a great genius), he was not only sorry for his inattention, but he assisted with his advice the painter whom he had offended. He made no mystery of his art any more than of his sentiments. Clement XIV. submitted to his judgment some pictures of no great value, and in excuse told him that he had bought them at the recommendation of an eminent painter. "This man and I (replied Mengs) are two artists, one of whom praises every thing which he cannot equal, and the other blames every thing which he can surpass." His manners were pure and simple, and enthusiasm for the arts had almost extinguished in him every other passion. He was a good husband and a good father; and his family could reproach him with nothing but want of economy and unbounded generosity. Although he had received during the last 18 years of his life more than 250,000 livres, he hardly left wherewithal to defray the expences of his funeral. The king of Spain adopted his five daughters, and granted pensions to his two sons. His chief works in the line of his profession are at Madrid and at Rome. A catalogue of them is to be found in the account of his life prefixed to his whole works, in 2 vols 4to, published at Parma in 1780 by the Chevalier d'Azara, with notes. The first volume contains, 1. Reflections on the *beautiful*, and on taste in painting. 2. Reflections on Raphael, Corregio, Titian, &c. 3. On the means of promoting the cultivation of the fine arts in Spain.—The second volume contains, 1. Two letters on the group of Niobé. 2. A letter on the origin, progress, and decline of drawing. 3. A letter on the principal paintings at Madrid. 4. Memoirs of the life and works of Correggio. 5. Memoirs concerning the academy of fine arts at Madrid. 6. Practical lessons in painting. Part of his works have been translated into French by M. Doray de Longrais, and published at Paris 1782 in 8vo. A collection of them was lately published in 4to, 2 vols, 1787.—Mengs placed Raphael at the head of modern painters for design and expression, Corregio for gracefulness of attitude and the *claro obscuro*, and Titian for colouring. He formed his own style upon the different excellencies of those three artists. He united the most sublime expression to the truest colouring, and to that knowledge of different effects which captivates the senses at the first impression, and which will bear the most rigid examination. His paintings possess chiefly that grace which one feels without being able to explain. Nobody ever studied the ancients with greater care than he did. The technical part in *l'Histoire de l'Art*, by his friend the Abbé Winckelman, is of his composition. He respected and admired the ancients; but he was destitute of that excessive zeal which makes their votaries conceal those faults which they perceive.

MENIALS, domestic or household servants, who live under their lord or master's roof.

MENINGES, or MENYNGES, in anatomy, a name given to the dura and pia mater of the brain. See ANATOMY, n° 129.

MENINX, an island in the Mediterranean, to the west of the Syrtis Minor. Supposed by Strabo and Polybius to be Homer's country of the Lotophagi; and hence Ptolemy and Eratosthenes denominate the island *Lotophagitis*, with a cognominal town *Meninx*. It was the country of Vibius Gallus the emperor, and of Volusianus. Now called *Gerbi* and *Zarbi*.

MENIPPUS, a cynic philosopher of Phœnicia. He was originally a slave, but obtained his liberty with a sum of money, and became one of the greatest usurers at Thebes. He grew so desperate from the continual reproaches and insults to which he was daily exposed on account of his meanness, that he destroyed himself. He wrote 13 books of satires, which have been lost.

MENIPPEAN (*satira* MENIPPEA), a kind of satire consisting of prose and verse intermixed. It is thus called from Menippus a cynic philosopher who delighted in composing satirical letters, &c. In imitation of him, Varro also wrote satires under the title of *Satiræ Menippeæ*: whence this sort of composition is also denominated *Varronian satire*.

Among the moderns there is a famous piece under this title first published in 1594, against the chiefs of the league, called also the *Catholicon* of Spain. It is esteemed a master-piece for the time.

MENISCUS, in optics, a glass or lens, concave on one side and convex on the other; sometimes also called *lunula*. See OPTICS.

MENISPERMUM, MOONSEED: A genus of the decandria order, belonging to the diœcia class of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The male has four exterior and eight interior petals; there are 16 stamina; the corolla of the female is the same as in the male; there are eight barren stamina, and two monospermous berries. There are three species, all of them climbing plants, rising 14 feet high, and natives of warm climates; but noway remarkable for beauty. The seeds of a kind which grows in the Levant, being formed into a paste, are regarded by the inhabitants as specific against lice and cutaneous eruptions. The same paste is likewise used for the purpose of intoxicating fishes. See *Cocculus Indicus*.

MENNITH, or MINNITH, Judges xi. 33. a town near Heshbon (Jerome), in Arabia Petræa; in a district named *Ecosipolis*, or *twenty-towns*, (Cellarius). There is also a Minnith mentioned Ezekiel xxvii. as being in a good wheat country: but whether the same with the foregoing is uncertain; though some think that the first Minnith lay in the country of Ammon, (Wells).

MENNONITES, a sect in the United Provinces, in most respects the same with those in other places called *Anabaptists*.

They had their rise in 1536, when Menno Simon, a native of Friesland, who had been a Romish priest, and a notorious profligate, resigned his rank and office in the Romish church, and publicly embraced the communion of the Anabaptists.

Menno was born at Witmarsum, a village in the neighbourhood of Bolswert in Friesland in the year 1505, and died in 1561 in the duchy of Holstein, at the country seat of a certain nobleman not far from the city of Oldesloe, who, moved with compassion by a view of the perils to which Menno was exposed, and the snares that were daily laid for his ruin, took him with certain of his associates into his protection, and gave him an asylum. The writings of Menno, which are almost all composed in the Dutch language, were published in folio at Amsterdam in the year 1651. About the year 1637, Menno was earnestly solicited by many of the sect with which he connected himself, to assume among them the rank and functions of a public teacher; and as he looked upon the persons who made this proposal to be exempt from the fanatical phrenzy of their brethren at Munster (though according to other accounts they were originally of the same stamp, only rendered somewhat wiser by their sufferings), he yielded to their intreaties. From this period to the end of his life, he travelled from one country

country to another with his wife and children exercifing his miniftry, under preffures and calamities of various kinds, that fucceeded each other without interruption, and conftantly expofed to the danger of falling a victim to the feverity of the laws. Eaft and Weft Friefland, together with the province of Groningen, were firft vifited by this zealous apoftle of the Anabaptifts; from whence he directed his courfe into Holland, Gelderland, Brabant, and Weftphalia, continued it through the German provinces that lie on the coafts of the Baltic Sea, and penetrated fo far as Livonia. In all thefe places his minifterial labours were attended with remarkable fuccefs, and added to his fect a prodigious number of followers. Hence he is defervedly confidered as the common chief of almoft all the *Anabaptifts*, and the parent of the fect that ftill fubfifts under that denomination. Menno was a man of genius, undirected by a very found judgment; he poffeffed a natural and perfuafive eloquence, and fuch a degree of learning as made him pafs for an oracle in the eftimation of the multitude. He appears, moreover, to have been a man of probity, of a meek and tractable fpirit, gentle in his manners, pliable and obfequious in his commerce with perfons of all ranks and characters, and extremely zealous in promoting practical religion and virtue, which he recommended by his example as well as by his precepts. The plan of doctrine and difcipline drawn up by Menno was of a much more mild and moderate nature than that of the furious and fanatical ANABAPTISTS, whofe tumultuous proceedings have been recited under that article, but fomewhat more fevere though more clear and confiftent than the doctrine of the wifer branches of that fect, who aimed at nothing more than the reftoration of the Chriftian church to its primitive purity. Accordingly he condemned the plan of ecclefiaftical difcipline that was founded on the profpect of a new kingdom, to be miraculoufly eftablifhed by Jefus Chrift on the ruins of civil government and the deftruction of human rulers, and which had been the fatal and peftilential fource of fuch dreadful commotions, fuch execrable rebellions, and fuch enormous crimes. He declared publicly his diflike of that doctrine, which pointed out the approach of a marvellous reformation in the church by the means of a new and extraordinary effufion of the Holy Spirit. He expreffed his abhorrence of the licentious tenets, which feveral of the Anabaptifts had maintained, with refpect to the lawfulnefs of polygamy and divorce; and finally, confidered as unworthy of toleration thofe fanatics who were of opinion that the Holy Ghoft continued to defcend into the minds of many chofen believers, in as extraordinary a manner as he did at the firft eftablifhment of the Chriftian church, and that he teftified this peculiar prefence to feveral of the faithful by miracles, predictions, dreams, and vifions of various kinds. He retained indeed the doctrines commonly received among the Anabaptifts, in relation to the baptifm of infants, the *millennium*, or 1000 years reign of Chrift upon earth, the exclufion of magiftrates from the Chriftian church, the abolition of war, and the prohibition of oaths enjoined by our Saviour, and the vanity as well as the pernicious effects of human fcience. But while Menno retained thefe doctrines in a general fenfe, he explained and modified them in fuch a manner as made them refemble the religious tenets that were univerfally received in the Proteftant churches; and this rendered them agreeable to many, and made them appear inoffenfive even to numbers who had no inclination to embrace them. It however fo happened, that the nature of the doctrines confidered in themfelves, the eloquence, of Menno which fet them off to fuch advantage, and the circumftances of the times, gave a high degree of credit to the religious fyftem of this famous teacher among the Anabaptifts, fo that it made a rapid progrefs in that fect. And thus it was in confequence of the miniftry at Menno, that the different forts of Anabaptifts agreed together in excluding from their communion the fanatics that difhonoured it, and in renouncing all tenets that were detrimental to the authority of civil government, and by an unexpected coalition formed themfelves into one community.

Though the Mennonites ufually pafs for a fect of Anabaptifts, yet M. Herman Schyn, a Mennonite minifter, who has publifhed their hiftory and apology, maintains, that they are not Anabaptifts either in principle or by origin. However, nothing can be more certain than this fact, viz. that the firft Mennonite congregations were compofed of the different forts of Anabaptifts, of thofe who had been always inoffenfive and upright, and of thofe who, before their converfion by the miniftry of Menno, had been feditious fanatics: befides it is alledged, that the Mennonites do actually retain, at this day, fome of thofe opinions and doctrines, which led the feditious and turbulent Anabaptifts of old to the commiffion of fo many and fuch enormous crimes: fuch particularly is the doctrine concerning the nature of Chrift's kingdom, or of the church of the New Teftament, though modified in fuch a manner as to have loft its noxious qualities, and to be no longer pernicious in its influence.

The Mennonites are fubdivided into feveral fects; whereof the two principal are the *Flandrians* or FLEMINGIANS, and the WATERLANDIANS. The opinions, fays Mofheim, that are held in common by the Mennonites, feem to be all derived from this fundamental principle, that the kingdom which Chrift eftablifhed upon earth is a vifible church or community, into which the holy and juft alone are to be admitted, and which is confequently exempt from all thofe inftitutions and rules of difcipline that have been invented by human wifdom, for the correction and reformation of the wicked. This principle, indeed, was avowed by the ancient Mennonites, but it is now almoft wholly renounced: neverthelefs, from this ancient doctrine, many of the religious opinions that diftinguifh the Mennonites from all other Chriftian communities, feem to be derived: in confequence of this doctrine, they admit none to the facrament of baptifm but perfons that are come to the full ufe of their reafon; they neither admit civil rulers into their communion, nor allow any of their members to perform the functions of magiftracy; they deny the lawfulnefs of repelling force by force, and confider war, in all its fhapes, as unchriftian and unjuft; they entertain the utmoft averfion to the execution of juftice, and more

efpecially

especially to capital punishments; and they also refuse to confirm their testimony by an oath. The particular sentiments that divided the more considerable societies of the Mennonites are the following: The rigid Mennonites, called the *Flemingians*, maintain, with various degrees of rigour, the opinions of their founder Menno, as to the human nature of Christ, alledging that it was produced in the womb of the Virgin by the creating power of the holy Ghost; the obligation that binds us to wash the feet of strangers, in consequence of our Saviour's command; the necessity of excommunicating and avoiding, as one would do the plague, not only avowed sinners, but also all those who depart, even in some light instances pertaining to dress, &c. from the simplicity of their ancestors; the contempt due to human learning, and other matters of less moment. However this austere system declines, and the rigid Mennonites are gradually approaching towards the opinions and discipline of the more moderate or *Waterlandians*.

The first settlement of the Mennonites, in the United Provinces, was granted them by William prince of Orange, towards the close of the 16th century; but it was not before the following century that their liberty and tranquillity were fixed upon solid foundations, when, by a confession of faith published in the year 1626, they cleared themselves from the imputations of those pernicious and detestable errors that had been laid to their charge. In order to appease their intestine discords, a considerable part of the Anabaptists of Flanders, Germany, and Friesland, concluded their debates in a conference held at Amsterdam, in the year 1630, and entered into the bonds of fraternal communion, each reserving to themselves a liberty of retaining certain opinions. This association was renewed and confirmed by new resolutions, in the year 1649; in consequence of which the rigorous laws of Menno and his successors were, in various respects, mitigated and corrected.

MENOCHIUS, vulgarly MENOCHIA, (James), a famous lawyer, meanly born at Pavia, but who became so skilful in the law, that he was called the *Baldus* and *Bartholus* of his age; all the princes of Italy soliciting him to their universities. He read at Padua 23 years together; and for love of his country removed to Pavia, and succeeded Nicholas Gratiani. He hath got an immortal fame by his works, *De recuperanda possessione; De adipiscenda possessione; De presumptionibus; De arbitrariis Judicum questionibus & causis conciliorum*, tom. 13. &c. He died in 1607, aged 75.

MENOLOGY, MENOLOGIUM, (from μην, *month*, and λογος, *discourse*), in much the same as martyrology, or callendar, in the Latin.

The Greek menologium is divided into the several months in the year; and contains an abridgement of the lives of the saints, with a bare commemoration of the names of such whose lives were never written. The Greeks have various menologies; and the Romans tax them with inserting divers heretics in their menologies as saints.—Baillet treats of them at large.

MENSA, in law-books, a term that includes in it all patrimony, and necessaries for livelihood.

MENSALS, MENSALIA, in church-history, such livings as were formerly united to the tables of religious houses, and hence called *mensal benefices*. See the article BENEFICE.

MENSES, CATAMENIA, in medicine, the monthly evacuations from the uterus of women not with child or not giving suck. They are so called from *mensis* "month," the period wherein they return. They are also called *flowers*, *courses*, &c. By the Jewish law a woman was unclean while the menstrual blood flowed; and the man who touched her, or the moveables she had touched, was declared unclean.—Levit. xv.

The menses make one of the most curious and difficult phenomena in the whole human body; for the explanation whereof, many hypotheses have been framed, though the matter is yet scarcely ascertained.

It is generally agreed by all, that the necessity women are under for some extraordinary supply to compensate the expence, and support them during the time of gestation, was the final reason why this redundance at other times was given them, which continues whilst this necessity subsists, and ceases when, according to the constitution of the female frame, it is no longer required: but this is all they agree in. Some, not content with this occasion alone, will have the menstruous blood offend in quality more than quantity; which they argue from the pain it gives many women in the evacuation; with many other idle notions.

Others ascribe this effect to an imaginary dominion of the moon over the bodies of women. This was formerly the prevailing opinion; though the smallest reflection would have shown the weakness of it: for, had this purgation been owing to the influence of the moon, all women of the same age and temperament would have found it at the same periods and revolutions of the moon, *i. e.* at the same time; which all experience shows to be false.

There are two other opinions which carry with them great probability, and are argued with a great deal of strength and reason; in both which, the quality of the blood is allowed to be innocent, but they still differ about the reason of its issue. The former is that of Dr Bohn and Dr Freind, who maintain this flux to be the result of a plethora or plenitude; and to be evacuated only for relief against the quantity.

Dr Freind, who has maintained the cause of a plethora with the greatest strength and clearness, supposes, that this plethora arises from a coacervation in the blood-vessels of a superfluity of aliment, which, he thinks, remains over and above what is expended by the ordinary ways; and that women have this plethora, and not men, because their bodies are more humid, and their vessels, especially the extremities of them, more tender, and their manner of living generally more inactive than that of men; and that these things concurring, are the occasion that women do not perspire sufficiently to carry off the superfluous alimentary parts, till they be accumulated in such quantities as to distend the vessels, and force their way thro' the capillary arteries of the uterus. It is supposed to happen to women more than the females of other species, which have the same parts, because of the erect posture of the former, and the

Menses. the vagina and other canals being perpendicular to the horizon; so that the pressure of the blood is directed towards their orifices: whereas in brutes, they are parallel to the horizon, and the pressure wholly is on the sides of those vessels. The discharge, he thinks, happens in this part rather than in any other, as being more favoured by the structure of the vessels; the arteries being very numerous, and the veins sinous and winding, and therefore more apt to retard the impetus of the blood; and consequently, in a plethoric case, to occasion the rupture of the extremities of the vessels, which may last, till, by a sufficient discharge, the vessels are eased of their overload.

This is the substance of Dr Freind's theory; from whence he very mechanically and very philosophically accounts for the symptoms.

To his argument, why women have menses rather than men, we may add from Boerhaave, that, in the former, the *os sacrum* is wider, and stands farther out, and the *os coccygis* farther in; the *ossa innominata* wider, and farther apart, and the lowest of them, as well as the lower eminences of the *os pubis*, farther outwards than in the latter. Hence, in women, the latitude or expansion about these bones, and the capacity of the *pelvis*, is vastly great in proportion to those of men; and yet, in a woman not pregnant, there is not much to fill this expanse. Again, the foreside of the thorax is smoother in women than in men, and the blood-vessels, lymphatics, adipose, and nervous vessels, membranes, and fibres, are much laxer in women than in men: whence all their cavities, cells, vessels, &c. are more easily replenished, and the humours aggregated in them; besides, that they are found to perspire less than men, and to arrive much sooner at their maturity, or ακμη of increase. To which he adds the consideration of the soft pulpous texture of the uterus, and the vast number of veins and arteries with which it is filled. Hence a healthy maid, being arrived at her growth, begins to prepare more nutriment than is required for the support of the body; which, as there is not to be any farther accretion, must of necessity fill the vessels, and especially those of the uterus and breasts, they being the least compressed. These will be dilated more than the others; whence the lateral vascules evacuating their humour into the cavity of the uterus, it will be filled and extended. Hence a pain, heat, and heaviness, will be felt about the loins, pubes, &c. the vessels of the uterus, at the same time, will be so dilated as to emit blood into the cavity of the uterus, and its mouth will be lubricated and loosened, and blood issue out. As the quantity of blood is diminished, the vessels will be less pressed, and will contract themselves again closer, so as again to retain the blood, and let pass the grosser part of the serum; till at length only the usual serum passes. Again, there are more humours prepared, which are more easily lodged in vessels once dilated; and hence the menses go and return at various periods in various persons.

This hypothesis, however plausible, is opposed by Dr Drake, who maintains, that there is no such repletion, or at least that it is not necessary to menstruation; arguing, that, if the menses were owing to a plethora so accumulated, the symptoms would arise gradually, and the heaviness, stiffness, and inactivity, necessary symptoms of a plethora, would be felt long before the periods were completed, and women would begin to be heavy and indisposed soon after evacuation, and the symptoms would increase daily; which is contrary to all experience, many women, who have them regularly and easily, having no warning, nor any other rule to prevent an indecent surprise, than the measure of the time; in which, some that have slipped, have been put to confusion and shifts no ways consistent with the notice a plethoric body would give. He adds, that even in those who are difficultly purged this way, the symptoms, though very vexatious and tedious, do not make such regular approaches as a gradual accumulation necessarily requires. If we consider what violent symptoms come on in an hour, we shall be extremely puzzled to find the mighty accession of matter, which should, in an hour or a day's time, make such great alterations. According to the hypothesis, the last hour contributed no more than the first; and of consequence, the alteration should not be greater in the one than in the other, setting aside the bare eruption.

This is the substance of what is argued against Dr Freind's theory; which, it must be owned, notwithstanding these objections, is still the most rational and consistent that has yet been advanced.

Those who oppose it, give into the doctrine of fermentation, and maintain the evacuation of blood in those parts to be an effect of an effervescence or ebullition of the blood. This opinion has been maintained by many, particularly by Dr Charleton, Bale, De Graaf, and Drake; the two first of whom suppose a ferment peculiar to the women, which produces this flux, and affects that part only, or at least principally. Dr Graaf, less particular in his notion, only supposes an effervescence of the blood, raised by some ferment, without assigning how it acts, or what it is. The sudden turgescence of the blood occasioned them all to think, that it arose from something till then extraneous to the blood, and led them to the parts principally affected to seek for an imaginary ferment, which no anatomical inquiry could ever show, or find any receptacle for, nor any reasoning necessarily infer. Again, that heat which frequently accompanies this turgescence, led them to think the case more than a plethora, and that there was some extraordinary intestine motion at that time.

Dr Drake improves on the doctrine of a ferment; and contends, not only that it is necessary there should be a ferment, but a receptacle also for this ferment; concluding, from the suddenness and violence of the symptoms, that a great quantity must be conveyed into the blood in a short time, and consequently, that it must have been ready gathered in some receptacle, where, while it was lodged, its action was restrained. But he goes farther still, and pretends to ascertain the place, &c. both of the one and the other, making the gall-bladder to be the receptacle, and the bile the ferment. This liquor he thinks well adapted to raise a fermentation in the blood, when discharged into it in a quantity; and, as it is contained in a receptacle that does not admit of a continual issue, it may be there reserved, till in a certain period of time the

Menfes. the bladder becoming turgid and full, through the compreffion of the incumbent vifcera, it emits the gall; which, by the way of the lacteals, infinuating itfelf into the blood, may raife that effervefcence which occafions the aperture of the uterine arteries. To confirm this, he alledges, that perfons of a bilious conftitution have the menfes either more plentifully, or more frequently, than others; and that diftempers manifeftly bilious, are attended with fymptoms refembling thofe of women labouring under difficult menftruation. —If it be objected, that on this principle men fhould have menfes as well as women, he anfwers, that men do not abound in bile fo much as women, the pores of the former being more open, and carrying off more of the ferous part of the blood, which is the vehicle of all the other humours, and confequently a greater part of each is difcharged through them than in women, wherein the fuperfluity muft either continue to circulate with the blood, or be gathered into proper receptacles, which is the cafe in the bile. The fame reafon he gives why menftruation fhould not be in brutes: the pores of thefe being manifeftly more open than thofe of women, as appears from the quantity of hair which they bear, for the vegetation whereof a large cavity, and a wider aperture of the glands, is neceffary, than where no fuch thing is produced: yet there is fome difference between the males and females even among thefe, fome of the latter having their menfes, though not fo often, nor in the fame form and quantity, as women.

He adds, that the feveral phenomena of the menfes, whether in a natural, a regular, or difeafed cafe, flow naturally and readily from this hypothefis; and that whatever may be accounted for from a plethora, or from any particular ferment, may without any ftraining be applied to this.

Females generally begin to menftruate about the age of fourteen or fifteen, and ceafe about fifty; though inftances have occurred of their commencing fooner and continuing longer. There are, therefore, two critical periods in the lives of females which require their particular attention. In order to efcape the chlorofis, and other fimilar difeafes, incident to that period of life when the menfes commence, they fhould avoid indolence and inactivity, and accuftom themfelves to exercife in the open air as much as poffible. Unwholefome food, dulnefs of difpofition, and ftrait cloaths, are very injurious to females at this feafon. The difcharge in the beginning is feldom fo inftantaneous as to furprife them unawares. The eruption is generally preceded by fymptoms that indicate its approach; fuch as a fenfe of heat, weight, and dull pain in the loins; diftenfion and hardnefs of the breafts, head-ach, lofs of appetite, laffitude, palenefs of the countenance, and fometimes a flight degree of fever. When thefe fymptoms occur, every thing fhould be carefully avoided which may obftruct the menftrual flux, and all means ufed to promote it; as fitting frequently over the fteams of warm water, drinking warm diluting liquors, &c. When the menfes have begun to flow, great care fhould be taken to avoid every thing that tends to obftruct them; fuch as fifh, and all kinds of food that are hard of digeftion, and cold acid liquors. Cold is likewife hurtful at this period; as alfo anger, fear, grief, and other affections of the mind. From whatever caufe this flux is obftructed, except in the ftate of pregnancy, proper means fhould be ufed to reftore it; and if exercife in a dry, open, and rather cool air, wholefome diet, generous liquors in a weak and languid ftate of the body, chearful company, and amufement fail, recourfe muft be had to medicine.— When obftructions proceed from a weak relaxed ftate of the folids, fuch medicines as tend to promote digeftion, to brace the folids, and affift the body in preparing good blood, ought to be ufed. See *Medicine-Index.* Menfes.

When the menftrual flux is too great, the patient becomes weak, the colour pale, the appetite and digeftion are bad, and œdematous fwellings of the feet, dropfies, and confumptions, often enfue. This frequently happens to women about the age of forty-five or fifty, and is very difficult of cure. It may proceed from a fedentary life; a full diet, confifting chiefly of falted, high feafoned, or acrid food; the ufe of fpirituous liquors; exceffive fatigue; relaxation; a diffolved ftate of the blood; violent paffions of the mind, &c. In order to reftrain the flux, the patient fhould be kept eafy both in body and mind. If it be very violent, fhe ought to lie in bed with her head low; to live upon a cool and flender diet, as veal or chicken-broths with bread, and to drink decoctions of nettle-roots or the greater comfrey. If thefe fail, recourfe muft be had to ftronger aftringents, &c. See Medicine nº 246.

The difcharge of the menfes is interrupted naturally during pregnancy: but this is not always the cafe, becaufe fome have them three months, fome fix months, and fome during the whole time of geftation, though in lefs quantity than at other times. The menfes are moftly interrupted during the time of giving fuck, though many women have a return about the third or fourth month after delivery, and almoft all have them again in the ninth or tenth month. In cafes of obftruction, the menftrual blood hath difcharged itfelf by other outlets.

It ufually happens that this periodical difcharge ceafes between the age of forty and fifty; and the feafon in which this takes place is critical to the fex.— However, thofe who furvive this period without contracting any chronical difeafe, become more healthy and vigorous than they were before. About this time, fome are afflicted with the well known fymptoms of plethora, heat, flufhings, reftlefs nights, troublefome dreams, and unequal fpirits; others are attacked with inflammations of the bowels, or other internal parts; fpafmodic affections of various parts, ftiffnefs in the limbs, fwelled ancles, with pain and inflammation, the piles, and other effects of plenitude. Thofe of full plethoric habits, accuftomed to copious evacuations, will find great relief by bleeding frequently in moderate quantities, keeping the bowels lax, moderating their diet, and ufing fufficient exercife that is not too heating. If an immoderate flux of the menfes happens at this period, it fhould be reftrained by gentle laxatives, cooling medicines, reft, anodynes, a moft fparing not too liquid diet, rather than by very copious bleedings and aftringents of any kind. Dr Fothergill obferves, that various purgations of aloes, the tinctura facra, pil. Ruffi, elixir proprietatis, and other compofitions of this kind, are recommended as proper purgatives

purgatives to be used on the cessation of the menses. But many inconveniences have arisen from these heating medicines, as the piles, strangury, immoderate discharges of the menses, racking pains in the loins, and other similar complaints. Rhubarb, sena, magnesia, sulphur medicines, small doses of jalap, and various combinations of these, may be substituted in the room of the others, and will supply sufficient variety to the prescriber and patient. When the menses are about to go off, they appear for the most part irregularly both in time and quantity; once in a fortnight, three, five, or six weeks; sometimes very sparingly, at other times in immoderate quantities. Great losses of this kind are often prevented by taking away four or five ounces of blood a few days after the first menstrual suppression. If a patient has in early life been subject to cutaneous eruptions, sore eyes, glandular swellings, or other obvious marks of morbid humours subsisting in the constitution, and all which may have disappeared about the time the menses became regular, an issue is an advisable drain, and may prevent many inconveniences. If at this time ulcerous sores break out about the ancles, or in other parts of the body, they ought to be continued open, or artificial drains substituted in their stead; for those who will have them dried up are soon after carried off by acute diseases, or fall into those of a chronic nature.

MENSORES, among the Romans, were harbingers, whose business it was to go before the emperor, and fix upon lodgings for him when he travelled into any of the provinces. They also marked out encampments, and assigned every regiment its post.

Mensores were also land-surveyors, architects, or appraisers of houses and public buildings. The distributors of provisions in the army were called *mensores frumentarii.* And mensores was also an appellation given to servants who waited at table.

MENSTRUAL, or MENSTRUOUS, a term in medicine, applied to the blood which flows from women in their ordinary monthly purgations. See MENSES.

MENSTRUUM, in chemistry, any body which in a fluid or subtilised state is capable of interposing its small parts betwixt the small parts of other bodies, so as to divide them subtilly, and form a new uniform compound of the two.

MENSURATION, in general, denotes the act or art of measuring lines, superficies, or solids. See GEOMETRY.

MENTHA, MINT, in botany: A genus of the gymnospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 42d order *Verticillatæ.* The corolla is nearly equal, and quadrifid, with one segment broader than the rest, and emarginated; the stamina are erect, standing asunder. There are many species; but not more than three are cultivated for use, namely, the viridis or common spearmint, the piperita or peppermint, and the pulegium or pennyroyal. All these are so well known as to need no description; and all of them are very easily propagated by cuttings, parting the roots, or by offsets.

Uses. For culinary purposes, the spearmint is preferable to the other two; but for medicine, the peppermint and pennyroyal have in some places almost entirely superseded it. A conserve of the leaves is very grateful, and the distilled waters both simple and spirituous are universally thought pleasant. The leaves are used in spring sallads; and the juice of them boiled up with sugar is formed into tablets. It has been imagined that cataplasms and fomentations of mint, would dissolve coagulations of milk in the breast; but Dr Lewis says, that the curd of milk, digested in a strong infusion of mint, could not be perceived to be any otherwise affected than by common water: however, milk, in which mint-leaves were set to macerate, did not coagulate near so soon as an equal quantity of the same milk kept by itself. Dr Lewis says, that dry mint digested in rectified spirits of wine, gives out a tincture, which appears by day-light of a fine dark green, but by candle-light of a bright red colour. The fact is, that a small quantity of this tincture is green either by day-light or by candle-light, but a large quantity of it seems impervous to common day-light; however, when held betwixt the eye and a candle, or betwixt the eye and the sun, it appears red.

The virtues of mint are those of a warm stomachic and carminative: in loss of appetite, nausea, and continual retching to vomit, there are few simples of equal efficacy. In colicky pains, the gripes to which children are subject, lienteries, and other immoderate fluxes, this plant frequently does good service. It likewise proves beneficial in many hysteric cases, and affords an useful cordial in languors and other weaknesses consequent upon delivery. The best preparation in these cases is a strong infusion of the dried herb in water (which is much superior to the green), or rather a tincture or extract prepared with rectified spirit. These possess the whole virtues of the mint; the essential oil and distilled water contain only the aromatic part; the expressed juice only the astringency and bitterishness, together with the mucilaginous substance common to all vegetables. The peppermint is much more pungent than the others.

Pennyroyal has the same general characters with the mint, but is more acrid and less agreeable when taken into the stomach. It has long been held in great esteem, and not undeservedly, as an aperient and deobstruent, particularly in hysteric complaints and suppressions of the menses. For these purposes the distilled water is generally made use of, or, what is of equal efficacy, an infusion of the leaves. It is observable, that both water and rectified spirit extract the virtues of this herb by infusion, and likewise elevate the greatest part of them by distillation. The expressed juice, with a little sugar, is not a bad medicine in the chincough.

MENTOR (fab. hist.), a faithful friend of Ulysses; a son of Hercules; a king of Sidonia, who revolted against Artaxerxes Ochus, and afterward was restored to favour by his treachery to his allies, &c. *Diod.* 16. An excellent artist in polishing cups and engraving flowers on them. *Plin.* 33. c. 11.—*Mart.* 9. ep. 60. v. 16.

MENTZ, an archbishopric and electorate in Germany. It lies on the banks of the river Mayne, between the electorate of Triers on the west, the Palatinate on the south, Franconia on the east, and the Wetteraw on

Mentz. on the north. It is about 60 miles in length from north-east to south-west, and about 50 in breadth. A considerable part of the elector's revenue arises from the toll on the Rhine and the Mayne, and from the tax on the excellent wines produced in this country. The chief towns of any trade are, 1. Mentz; (see the next article.) In its neighbourhood is Hockheim, so celebrated for good wines, that the best Rhenish is from thence called *old hock*. It is a pretty village, containing about 300 families; and belongs to the chapter of Mentz, the dean of which enjoys the revenue of it: in a good year he makes from twelve to fifteen thousand guilders of his wine He and the Augustines of Mentz and Francfort have the exclusive enjoyment of the best Hockheimer wine, of which, in good years, a piece, consisting of 100 measures, sells for from 900 to 1000 guilders from the press. "This (says the Baron Riesbeck) is certainly one of the dearest wines in the world. Having a desire to taste it on the spot, we were obliged to pay a rix-dollar; it was, however, of the best vintage in this century, viz. that of 1766. Nor should we have had it, but for an advocate of Mentz, to whom the hostess meant to show favour. This was the first German wine I had met with which was entirely without any sour taste: it was quite a perfume to the tongue; whereas the other wine of Hockheim, let it be as good as it may, is not quite clear of vinegar; though for this also, if it has any age, you are forced to pay a guilder and a half." 2. Bingen is a pleasant town, which stands in the district called *Rhinegau*. This town, which, together with the toll on the Rhine, is worth about 30,000 guilders, belongs to the chapter of Mentz, is extremely beautiful, and contains about 4500 inhabitants. A great part of the corn which is carried into the Rhinegau from the neighbouring Palatinate, comes through this place, which, on the other hand, supplies the Palatinate with drugs, and various foreign commodities. This traffic alone would make the place very lively; but besides this, it has very fruitful vineyards. The hill, at the foot of which it lies, and one side of which is made by the gullet, through which the Nahe runs into the Rhine, forms another steep rock behind this gullet parallel to the Rhine and the golden Rudesheimer mountain; it therefore enjoys the same sun as this does, which makes the Budesheimer wine that grows on it little inferior to the Rudesheimer. See Rudesheim. The rising grounds about it produce wines that are esteemed preferable to those of Baccharac, so much in vogue heretofore.—3. Elfeld, five miles west from Mentz, is a strong fortified town, on the north-side of the Rhine, and the chief of the Rhinegau.—Here is Rudesheim, a place noted for the growth of the best wines in these parts. 4. Weisbaden lies between six and seven leagues from Francfort, and about five or six miles north of Mentz: it is the metropolis of a country belonging to the branch of Nassau-Saarbrak, and is famous for its mineral waters.

After the pope, there is no doubt but the archbishop of this place is the most considerable and richest prelate in the Christian world. According to Baron Riesbeck, the see is indebted for its increase of riches to St Boniface, who may be called, with great justice, the apostle of the Germans. It was this man, an Englishman by birth, who in the time of Charlemagne baptized Witikind and the other brave Saxons who had so long resisted baptism with their swords, and spread the empire of the vicar of Jesus Christ as far as the northern and eastern seas. He it was who introduced the Roman liturgy into Germany, and made the savage inhabitants abstain from eating horse's flesh. He raised the papal power to a higher pitch than it had been raised in any other country in Christendom; and, in recompence of his services, the pope made all the new-founded bishoprics in the north of Germany subject to the see of Mentz, which Boniface had chosen for his residence. The provinces, the most considerable in the whole papal dominions, all Swabia, Franconia, Bohemia, and almost all Saxony, with a part of Switzerland, Bavaria, and the upper Rhine, belong to this diocese. Though the reformation, and revenge of the kings of Bohemia, have lessened it one third, it still contains the archbishopric of Sprengel and eleven bishoprics, most of which are the most considerable of Germany, as Wurzburg, Paderborn, Hildesheim, Augsbourg, &c. When the building of the papal monarchy was completed by Gregory VII. the archbishops of Mentz became powerful enough to be at the head of the empire. In the 13th and 14th centuries, they were so eminent as to be able to make emperors without any foreign assistance; and it was to one of them that the house of Hapsburg was indebted for its first elevation. Since the boundaries of the two powers have been more accurately ascertained, and the temporal has so much got the better of the spiritual, the power and influence of the archbishops of this place have of course been much reduced; still, however, they are possessed of very important prerogatives, which they might exert with much more efficacy than they do, were it not that various circumstances have rendered them too dependent on the emperors. They are still the speakers in the Electoral College, have the appointment of the diets under the emperors, and may order a re-examination of the proceedings of the imperial courts. These high privileges are, however, too much subject to the controul of the house of Austria; nor are their spiritual powers any longer what they once were. Their suffragan bishops have taken it into their heads that all bishops are alike as to power, and that the title of archbishop only intitles its possessor to the first place amongst brothers who are equal. The temporals, however, which are still annexed to this chair, make him who sits in it rich amends for the diminution of his spiritual and political splendor. Though he does not absolutely possess the largest, yet he certainly has the richest and most peopled domain of any ecclesiastical potentate in Germany. The country, it is true, does not contain more than 125 German miles square, whereas the archbishopric of Saltzburg contains 210; but then Saltzburg has only 250,000 inhabitants, whereas Mentz has 320,000. The natural riches of the territory of Mentz, and its advantageous situation, make a subject of Mentz much richer than one of Saltzburg, the greatest part of which is only inhabited by herdsmen. In the territory of Mentz there are 40 cities; in that of Saltzburg only seven The tax on vessels which go down the Rhine of itself produces 60,000 guilders, or 6000 l. a year, which is nearly

Mentz. nearly as much as all the mines of Saltzburg put together, excepting only the falt mine at Halle. The tax on wine, here and in the country round, produces the court above 100,000 guilders, or 10,000 l. a-year, in which fum we do not reckon the cuftoms of the countries which lie at a greater diftance. Upon the whole, the income of the prefent archbifhop may be valued at 1,700,000 guilders, or 170,000 l.

If the lands of the elector lay all together, they would produce a fufficiency of corn and all the prime neceffaries of life; but as feveral parts of them lie wide affunder, the people are compelled to purchafe a great deal from foreigners. The capital itfelf, as well as the adjacent Rhinegau, depends on the Palatinate for its corn, notwithftanding the great abundance of that and every other fpecies of grain in its own poffeffions in Wetterau. The nobleft production of the elector's territory on the Rhine is the wine, which is almoft the only true Rhenifh. Connoiffeurs, indeed, allow the wines of Neirftein, Bacharach, and a very few other places out of this country, to be true Rhenifh: but they do not give this name to the wines of the Palatinate, of Bardon, and of Alfatia. There is a great deal of wine made in the countries which lie on the fouth and weft of the Rhine, at Laubenheim, Bodenheim, Budefheim, and Bingen; but the true Rhenifh, that which infpires fo many who are and fo many who are not poets, comes only from the Rhinegau, which lies on the northern banks of the Rhine. See Rhinegau.

The civil lift of the archbifhop (according to Baron Riefbeck), is by much too immoderate and expenfive "He has his minifters, his counfellors of ftate, and eighty or ninety privy counfellors of various denominations. The expence of this eftablifhment is very difproportionate to the revenue of the ftate. This is owing to the large number of poor nobility, who can only accept of employments of this kind. Ignorance of the true principles of government are the caufes of this evil The confequences are, that a great number of perfons, who might be ufefully employed, live in idlenefs Even the military eftablifhment of the country appears to me more calculated for the purpofe of feeding a hungry nobility than for real ufe. At the acceffion of the prefent elector, though the whole army only confifted of 2400 men, there were fix generals. The regular eftablifhment paid for and fupported by the country is 8000 men; but though there are only 2000 men kept up, the money expended for their fupport, particularly that given to numberlefs ufelefs officers, might be made ufe of more for the benefit of the country. The army of the archbifhop confifts of a German guard of 50 men and 25 horfes, a Swifs guard, a fquadron of huffars of 13 men (the moft ufeful troops, as they purge the land of robbers and murderers), a corps of artillery of 104 men, three regiments of infantry of 600 men each, and fome companies belonging to the armies of Franconia and the Upper Palatinate. Of the fortifications of the capital we may fay much the fame as of the army. Were they, indeed, improved and kept up as they ought to be, they would vie with Luxemburg, and be the moft powerful of all the barriers againft France. It is true, that the nature of the ground does not allow of a regular plan; but for fingle parts, I have feen no place of the fame capabilities, where greater advantages have been taken of the ground for the erection of the feveral works. The beauty, as well as fize of them, is indeed an object of great wonder; but though the circle of the Upper Rhine, and even the empire in general, has laid out great fums on the building thefe fortifications, parts of them are not finifhed, and parts of them are ready to fall to pieces. Their extent, indeed, would require a great army to man them. But this, as well as the maintaining and keeping them up, is evidently beyond the power of this court, or indeed of the whole circle of the Upper Rhine united. They are, therefore, alfo to be looked upon as one of the things which ferve more for magnificence than real ufe." Mentz.

Mentz, a confiderable town of Germany, in the circle of the Lower Rhine, and capital of the electorate of the fame name, is fituated on the Rhine near its confluence with the Mayne, 20 miles north-weft of Worms, 15 weft of Francfort, and 75 eaft of Triers, in E. Long. 8. 20. N. Lat. 49. 51. This city claims a right to the invention of the art of printing: (fee *Hiftory of* Printing). Here is a very beautiful quay along the river, defended by feveral works well fortified with cannon. That part of the city which extends towards the river is moft populous. The beft vineyards for Rhenifh wine being in this neighbourhood, Mentz has a flourifhing trade in that commodity more particularly; and its commerce is the brifker, by reafon that all the merchandize which paffes up and down the Rhine ftops in its harbour to change bottoms.

The northern part of the city, in which the archbifhop refides, is full of very regular buildings. Here are three regular ftreets, called the *Bierchen*, which run parallel to each other from the banks of the Rhine to 600 yards within the city, and are cut almoft regularly by very pretty crofs ftreets. The archbifhop's palace has a moft commanding view of thefe ftreets, the Rhine, and the Rhinegau. There are alfo fome good buildings in the old part of the city. The market of beafts is extremely well worth feeing; and you here and there meet with other agreeable fpots. The market in the middle of the town, though not regular, is one of the pretticft places in Germany. The cathedral is well worth notice. It is an immenfe large old Gothic building, the fpire of which was ftruck with lightning about 20 years ago, and entirely laid in afhes. As it was made of a foreft of wood, it burned 14 hours before it was entirely confumed. To prevent thefe accidents for the future, the chapter had the prefent one built to the fame height in ftone, an undertaking which coft them 40,000 guilders or L. 4000. It is a great pity (Baron Riefbeck obferves) that it is overloaded with fmall ornaments; and a ftill greater, that this wonderful edifice is fo choaked up with fhops and houfes as to be hardly more than half vifible. As, however, houfes and fhops are very dear in this part of the town, one cannot be very angry with the chapter for choofing rather to make the moft of its ground, than to fhow off the church to the beft advantage. The rent of a fhop and a fingle room to live in is 150 guilders or L. 15 per annum in this part of the town.

Mentz. There is hardly another church in Germany of the height and length of this cathedral; and the inside of it is decorated with several magnificent monuments of princes and other great personages. Besides the cathedral, the city of Mentz contains several other churches in the modern style, very well worth seeing. St Peter's, and the Jesuits church, though both too much loaded with ornament, are among this number. The church of the Augustines, of which the inhabitants of Mentz are so proud, is a master-piece of bad taste; but that of Ignatius, though little is said about it, would be a model of the antique, if here likewise there had not been too much ornament lavished. Upon the whole, the palaces of the noblesse want that noble simplicity which alone constitutes true beauty and magnificence. In another century the externals of the city will be quite changed. The late prince built a great deal, and the present has a taste for the same sort of expence. The monks and governors of hospitals also have been forced to rebuild their houses; so that when a few more streets are made broader and straighter, the whole will have no bad appearance. The inhabitants, who together with the garrison amount to 30,000, are a good kind of people, and, like all the catholics of Germany, make great account of a good table. Their faces are interesting, and they are not deficient either in wit or activity.

There are few cities in Germany besides Vienna which contain so rich and numerous a nobility as this does: there are some houses here which have estates of 100,000 guilders, or L. 10,000 a-year. The counts of Bassenheim, Schonborn, Stadion, Ingelheim, Elz, Ostein, and Walderdorf, and the lords of Dahlberg, Breitenbach, with some others, have incomes of from 30,000 to 100,000 guilders. Sixteen or eighteen houses have from 15,000 to 30,000 guilders annual revenue.—The nobility of this place are said to be some of the oldest and most untainted in Germany. There are amongst them many persons of extraordinary merit, who join uncommon knowledge to all the duties of active life. Upon the whole, they are far superior to the greater part of the German nobility. Their education, however, is still too stiff. The first minister of the court was refused admittance into their assemblies for not being sufficiently noble; and they think they degrade themselves by keeping company with bourgeois.

The clergy of this place are the richest in Germany. A canonry brings in 3500 Rhenish guilders in a moderate year. The canonry of the provost brings him in 40,000 guilders a-year; and each of the deaneries is worth 2600 guilders. The income of the chapter altogether amounts to 300,000 guilders. Though it is forbidden by the canons of the church for any one to have more than a single prebend, there is not an ecclesiastic in this place but what has three or four; so that there is hardly a man amongst them who has not at least 8000 guilders a-year. The last provost, a count of Elts, had prebends enough to procure him an income of 75,000 guilders. Exclusive of the cathedral, there are several other choirs in which the canonries bring in from 1200 to 1500 guilders a-year. To give an idea of the riches of the monasteries of this place, Baron Riesbeck informs us, that at the destruction of the Jesuits, their wine, which was reckoned to sell extremely cheap, produced 120,000 rixdollars. A little while ago the elector abolished one Carthusian convent and two nunneries, in the holy cellars of which there was found wine for at least 500,000 rixdollars. "Notwithstanding this great wealth (continues our author), there is not a more regular clergy in all Germany. There is no diocese in which the regulations made by the council of Trent have been more strictly adhered to than they have here; the archbishops having made a particular point of it both at the time of the reformation and ever since. One thing which greatly contributes to keep up discipline is the not suffering any priest to remain in the country who has not fixed and stated duties, and a revenue annexed to them. Most of the irregularities in Bavaria, Austria, and other countries, arise from abbés who are obliged to subsist by their daily industry and any masses which they can pick up. These creatures are entirely unknown here. The theological tenets of this court are also much purer than those of any other ecclesiastical prince in Germany. I was pleased to see the Bible in the hands of so many common people, especially in the country. I was told that the reading of it was not forbidden in any part of the diocese; only persons were enjoined not to read it through, without the advice of their confessors. For a long time superstition has been hunted through its utmost recesses; and though it is not quite possible to get entirely clear of pilgrimages and wonder-working images, you will meet with no priest bold enough to exorcise or to preach such nonsense as we hear in the pulpits of other German churches."

Though the trade of this place has been constantly on the increase for these 18 or 20 years past, yet it is by no means what it ought to be from the situation and other advantages. The persons here who call themselves merchants, and who make any considerable figure, are in fact only brokers, who procure their livelihood at the expence of the country or territory round, or who act for the merchants of Franckfort. A few toy-shops, five or six druggists, and four or five manufacturers of tobacco, are all that can possibly be called traders. There is not a banker in the whole town; and yet this country enjoys the staple privilege, and commands by means of the Mayne, Necker, and Rhine, all the exports and imports of Alsatia, the Palatinate, Franconia, and a part of Suabia and Hesse, as far as the Netherlands. The port too is constantly filled with ships, but few of them contain any merchandize belonging to the inhabitants of the place.

Mentzel. MENTZEL (Christian), born at Furstenwall in the Mittel-mark, is celebrated for his skill in medicine and botany, in pursuit of which he travelled through many countries. He had correspondents in the most distant parts of the world. He died A. D. 1701, about the 79th year of his age. He was a member of the academy *des Curieux de la Nature*. His works are, 1. *Index nominum plantarum*, printed at Berlin in folio, 1696; and reprinted with additions in 1715, under the title of *Lexicon plantarum polyglotton universale*. 2. A Chronology of China, in German, printed at Berlin 1696 in 4to. The following manuscripts of his composition are preserved in the royal library at Berlin. 1. *Sur l'Histoire Naturelle du Brasil*, in four volumes folio.

lio. 2. *Sur les Fleurs et les Plantes du Japon*, with coloured plates, two vols folio.

MENUS (anc. geog.), a river of Germany; now the *Maine*, rising in Franconia, and running from east to west into the Rhine at Mentz.

MENUTHIAS (anc. geog.), an island adjoining to the north-east of the promontory Prasum of Ethiopia beyond Egypt. Some take it to be *Madagascar*, or the island *St Laurence*. Isaac Vossius will have it to be *Zanzibar*; Madagascar being at a greater distance from the continent than the ancients ever sailed to, whereas Menuthias was nearer: yet though Zanzibar be nearer the continent, it is however nearer the equator than Ptolemy's Menuthias, placed in south latitude 12½ degrees.

MENYANTHES, MARSH-TREFOIL, or *Buckbean*: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 21st order, *Preciæ*. The corolla is hairy; the stigma bifid; the capsule unilocular. This plant grows wild in moist marshy places in many parts of Britain. It has three oval leaves standing together upon one pedicle, which issues from the root; their taste is very bitter, and somewhat nauseous. According to Mr Lightfoot, the flowers of this plant are so extremely beautiful, that nothing but their native soil could exclude it from a place in every garden. They grow in an elegant spike; are white, dashed with pink, and fringed internally with hairs. The Highlanders esteem an infusion or tea of the leaves as good to strengthen the stomach. According to Dr Withering, an infusion of the leaves is prescribed in rheumatisms and dropsies; a dram of them in powder purges and vomits, and is sometimes given to destroy worms. In a scarcity of hops, the plant is used in the north of Europe to bitter the ale. The powdered roots are sometimes used in Lapland instead of bread, but they are unpalatable. Some people say, that sheep will eat it, and that it cures them of the rot; but from the Upsal Experiments it appears, that though goats eat it, sheep sometimes will not. Cows, horses, and swine, refuse it.—Dr Lewis informs us, that it is an efficacious aperient and deobstruent; promotes the fluid secretions; and, if liberally taken, gently loosens the belly. It has of late gained great reputation in scorbutic and scrophulous disorders; and its good effects in those cases have been warranted by experience. Inveterate cutaneous diseases have been removed by an infusion of the leaves, drank to the quantity of a pint a-day, at proper intervals, and continued for some weeks. Boerhaave relates, that he was relieved of the gout by drinking the juice mixed with whey.

MENZIKOFF (Alexander), was originally an apprentice to a pastry-cook near the palace of Moscow; but by a fortunate circumstance was drawn from that situation in early life, and placed in the household of Peter the Great. Having made himself master of several languages, and being formed for war and for business, he first rendered himself agreeable, and afterwards became necessary, to his master He assisted Peter in all his projects; and was rewarded for his services with the government of Ingria, the rank of prince, and the title of *major-general*. He signalized himself in Poland in 1708 and 1709; but in 1713 he was accused of embezzling the public money, and fined in 300,000 crowns. The Czar remitted the fine; and having restored him to favour, gave him the command of an army in the Ukraine in 1719, and sent him as his ambassador into Poland in 1722. Constantly employed about the means of preserving his influence after the death of his master, who was then evidently on the decline, Menzikoff discovered the person to whom the Czar intended to leave the succession. The emperor was highly offended, and his penetration cost him the principality of Plescoff. Under the Czarina Katharine, however, he was higher in favour than ever; because, on the death of the Czar in 1725, he was active in bringing different parties in Russia to agree to her succession. This princess was not ungrateful. In appointing her son-in-law Peter II. to be her successor, she commanded him to marry the daughter of Menzikoff, and gave the Czar's sister to his son. The parties were actually betrothed; and Menzikoff was made duke of Cozel and grand steward to the Czar. But this summit of elevation was the prelude to his fall. The *Dolgoroukis*, favourites of the Czar, had influence enough to procure his banishment, together with that of his family, to one of his own estates at the distance of 250 leagues from Moscow. He had the imprudence to leave the capital with the splendor and magnificence of a governor going to take possession of his province. His enemies took advantage of this circumstance to inflame the indignation of the Czar. At some distance from Moscow he was overtaken by a detachment of soldiers. The officer who commanded them made him alight from his chariot, which he sent back to Moscow; and placed him and his whole family in covered waggons, to be conducted into Siberia, in the habit of peasants. When he arrived at the place of his destination, he was presented with cows and sheep big with young, and poultry, without knowing from whom he received the favour. His house was a simple cottage; and his employment was to cultivate the ground, or to superintend its cultivation. New causes of sorrow were added to the severities of exile. His wife died in the journey; he had the misfortune to lose one of his daughters by the small-pox; and his other two children were seized with the same disease, but recovered. He sunk under his misfortunes, November 2. 1729; and was buried beside his daughter, in a little chapel which he had built. His misfortunes had inspired him with sentiments of devotion, which, amid the splendor of his former situation, he had altogether neglected. His two surviving children enjoyed greater liberty after the death of their father. The officer permitted them to attend public worship on Sundays by turns. One day when his daughter was returning from the village, she heard herself accosted by a peasant from the window of a cottage, and, to her great surprize, recognised in this peasant the persecutor of her family, Dolgorouki; who, in his turn, had fallen a sacrifice to the intrigues of the court. She communicated this intelligence to her brother, who could not behold, without emotion, this new instance of the vanity and instability of honours and power. Young Menzikoff and his sister were soon after recalled to Moscow by the Czarina Ann; and left Dolgorouki in possession of their cottage. He was made

made captain of the guards, and received the fifth part of his father's possessions. His sister was appointed maid of honour to the Empress, and afterwards married to great advantage.

MENZINI (Benedict), a celebrated Italian poet, born at Florence, was professor of eloquence at the college Della Sapienza at Rome, where he died in 1704. He wrote, 1. The art of poetry. 2. Satires, elegies, hymns, and the Lamentations of Jeremiah. 3. *Academia Tusculana*, a work in verse and prose, which passes for his masterpiece.

MEOTIS, or PALUS MEOTIS, a sea of Turky, which divides Europe from Asia; extending from Crim Tartary to the mouth of the river Don or Tanais.

MEPHITIC, a name expressing any kind of noxious vapour; but generally applied to that species of vapour called *fixed air*. See AIR, FIXED *Air*, GAS, &c.

MEPHITIS FANUM, a temple erected to the goddess Mephitis, near Lacus Amsancti; who was worshipped also at Cremona. Figuratively, *Mephitis* denotes a noisome or pestilential exhalation, (Virgil.)

MEQUINEZ, or MIQUINEZ, the northern capital of the Morocco empire, stands at the extremity of the province of Beni-Hassen, 80 leagues north from the city of Morocco (which is the southern imperial city), and 20 to the east of Salee and the ocean. Maknassa, its founder, built it first at the bottom of a valley; but Muley Ismael extended it considerably over the plain that lies to the west of the valley. It is surrounded with well cultivated fields and hills, adorned with gardens and olive plantations, and abundantly watered with rivulets. Accordingly, fruits and kitchen stuffs thrive here exceedingly, and even the superior urbanity of the inhabitants announces the temperature of the climate. The winter indeed is very inconvenient, on account of the dirtiness of the town, the streets not being paved, and the soil being slimy.

Mequinez is surrounded with walls; the palace itself is fortified with two bastions, on which formerly some small guns were mounted. Muley Ismael, and Muley Abdallah, often in this city resisted the efforts of the Brebes, the sworn enemies of their tyranny. To the west are seen some walls of circumvallation, six feet in height, which were probably mere intrenchments for the infantry; the attacks of the Brebes being only sudden and momentary inroads, which did not require long defence. There is at Mequinez, as well as at Morocco, a walled and guarded suburb for the Jews. The houses are neater here than at Morocco. The Jews here are more numerous; and they can turn their industry to greater account, because the Moors in this city are more polished, and (being nearer to Europe) more visited, than those in the southern parts. Near the Jewry, there is another inclosed and separate quarter, called the *Negro-town*. It was built by Muley Ismael, for the accommodation of those black families which composed his soldiery. This town is now uninhabited, as are all those destined for the same use through the rest of the empire.

At the south-east extremity of the city stands the palace of the emperor, which was built by Muley Ismael. The space occupied by this palace is very great; it includes several gardens, elegantly disposed, and well watered. There is a large garden in the centre, surrounded by a vast and pretty regular gallery, resting on columns, which communicates with the apartments. Those of the women are very spacious, and have a communication with a large chamber which looks into the garden. As you pass from one apartment to another, you find at intervals regular courts paved with square pieces of black and white marble; in the middle of these courts is a marble bason, from the centre of which rises a *jet-d'eau*, and the water falls down into this bason. These fountains are numerous in the palace; they are useful for domestic purposes, and they serve for the ablutions, which the scruples of the Mahometans have exceedingly multiplied. The palaces of the Moorish kings are large, because they are composed only of one range of apartments; these are long and narrow, from 18 to 20 feet high; they have few ornaments, and receive the light by two large folding doors, which are opened more or less as occasion requires. The rooms are always lighted from a square court in the centre, which is generally encompassed with a colonade.

The Moors here are more courteous than those in the southern parts; they are civil to strangers, and invite them into their gardens, which are very neat. The women in this part of the empire are beautiful; they have a fair complexion, with fine black eyes, and white teeth. I have sometimes seen them taking the air on the terraces; they do not hide themselves from Europeans, but retire very quickly on the appearance of a Moor.

MERA-DE-ASTA, formerly a large town of Andalusia, seated on the river Guadaleta, between Arcos and Xeres de la Frontera; but now only a large heap of ruins. Here the Arabs conquered Roderick the last king of the Goths, and by that victory became masters of Spain in 713.

MERCATOR (Gerard), one of the most celebrated geographers of his time, was born at Ruremonde in 1512. He applied himself with such industry to geography and mathematics, that he is said to have frequently forgot to eat and drink. The emperor Charles V. had a particular esteem for him, and the duke of Juliers made him his cosmographer. He composed a chronology, some geographical tables, an Atlas, &c. engraving and colouring the maps himself. He died in 1594. His method of laying down charts is still used, and bears the name of *Mercator's charts*.

MERCATOR (Nicholas), an eminent mathematician in the 17th century, was born at Holstein in Denmark; and came to England about the time of the restoration, where he lived many years. He was fellow of the Royal Society; and endeavoured to reduce astrology to rational principles, as appeared from a MS. of his in the possession of William Jones, Esq. He published several works, particularly *Cosmographia*. He gave the quadrature of the hyperbole by an infinite series; which was the first appearance in the learned world of a series of this sort drawn from the particular nature of the curve, and that in a manner very new and abstracted.

MERCATOR's Sailing, that performed by Mercator's chart. See NAVIGATION.

MERCATORUM

cato- um, han'.

MERCATORUM festum, was a feſtival kept by the Roman merchants on the 15th of May in honour of Mercury, who preſided over merchandiſe. A ſow was ſacrificed on the occaſion, and the people preſent ſprinkled themſelves with water fetched from the fountain called *aqua Mercurii*; the whole concluding with prayers to the god for the proſperity of trade.

MERCHANT, a perſon who buys and ſells commodities in groſs, or deals in exchanges; or that traffics in the way of commerce, either by importation or exportation. Formerly every one who was a buyer or ſeller in the retail way was called a *merchant*, as they ſtill are both in France and Holland; but here ſhopkeepers, or thoſe who attend fairs or markets, have loſt that appellation.

Previous to a perſon's engaging in a general trade, and becoming an univerſal dealer, he ought to treaſure up ſuch a fund of uſeful knowledge as will enable him to carry it on with eaſe to himſelf, and without riſking ſuch loſſes as great ill-concerted undertakings would naturally expoſe him to. A merchant ſhould therefore be acquainted with the following parts of commercial learning. 1. He ſhould write properly and correctly. 2. Underſtand all the rules of arithmetic that have any relation to commerce. 3. Know how to keep books of double and ſingle entry, as journals, a leger, &c. 4. Be expert in the forms of invoices, accounts of ſales, policies of inſurance, charter-parties, bills of lading, and bills of exchange. 5. Know the agreement between the money, weights, and meaſures of all parts. 6. If he deals in ſilk, woollen, linen, or hair manufactures, he ought to know the places where the different ſorts of merchandizes are manufactured, in what manner they are made, what are the materials of which they are compoſed, and from whence they come, the preparations of theſe materials before working up, and the places to which they are ſent after their fabrication. 7. He ought to know the lengths and breadths which ſilk, woollen, or hair-ſtuffs, linen, cottons, fuſtains, &c. ought to have according to the ſeveral ſtatutes and regulations of the places where they are manufactured, with their different prices, according to the times and ſeaſons; and if he can add to his knowledge the different dyes and ingredients which form the various colours, it will not be uſeleſs. 8. If he confines his trade to that of oils, wines, &c. he ought to inform himſelf particulary of the appearances of the ſucceeding crops, in order to regulate his diſpoſing of what he has on hand; and to learn as exactly as he can what they have produced when got in, for his direction in making the neceſſary purchaſes and engagements. 9. He ought to be acquainted with the ſorts of merchandize found more in one country than another, thoſe which are ſcarce, their different ſpecies and qualities, and the propereſt method for bringing them to a good market either by land or ſea. 10. To know which are the merchandizes permitted or prohibited, as well on entering as going out of the kingdoms or ſtates where they are made. 11. To be acquainted with the price of exchange, according to the courſe of different places, and what is the cauſe of its riſe and fall. 12. To know the cuſtoms due on importation or exportation of merchandizes, according to the uſage, the tariffs, and regulations, of the places to which he trades. 13. To know the beſt manner of folding up, embaling, or tunning, the merchandizes for their preſervation. 14. To underſtand the price and condition of freighting and inſuring ſhips and merchandize. 15. To be acquainted with the goodneſs and value of all neceſſaries for the conſtruction and repairs of ſhipping, the different manner of their building; what the wood, the maſts, cordage, cannons, ſails, and all requiſites, may coſt. 16. To know the wages commonly given to the captains, officers, and ſailors, and the manner of engaging with them. 17. He ought to underſtand the foreign languages, or at leaſt as many of them as he can attain to; theſe may be reduced to four, viz. the Spaniſh, which is uſed not only in Spain but on the coaſt of Africa, from the Canaries to the Cape of Good Hope: the Italian, which is underſtood on all the coaſts of the Mediterranean, and in many parts of the Levant: the German, which is underſtood in almoſt all the northern countries; and the French, which is now become almoſt univerſally current. 18 He ought to be acquainted with the conſular juriſdiction, with the laws, cuſtoms, and uſages of the different countries he does or may trade to; and in general all the ordinances and regulations both at home and abroad that have any relation to commerce. 19. Though it is not neceſſary for a merchant to be very learned, it is proper that he ſhould know ſomething of hiſtory, particularly that of his own country; geography; hydrography, or the ſcience of navigation; and that he be acquainted with the diſcoveries of the countries in which trade is eſtabliſhed, in what manner it is ſettled, of the companies formed to ſupport thoſe eſtabliſhments, and of the colonies they have ſent out.

Merchant, Merchet.

All theſe branches of knowledge are of great ſervice to a merchant who carries on an extenſive commerce; but if his trade and his views are more limited, his learning and knowledge may be ſo too: but a material requiſite for forming a merchant is, his having on all occaſions a ſtrict regard to truth, and his avoiding fraud and deceit as corroding cankers that muſt inevitably deſtroy his reputation and fortune.

Trade is a thing of ſo univerſal a nature, that it is impoſſible for the laws of Britain, or of any other nation, to determine all the affairs relating to it: therefore all nations, as well as Great Britain, ſhow a particular regard to the law-merchant, which is a law made by the merchants among themſelves: however, merchants and other ſtrangers are ſubject to the laws of the country in which they reſide. Foreign merchants are to ſell their merchandize at the port where they land, in groſs, and not by retail; and they are allowed to be paid in gold or ſilver bullion, in foreign coin or jewels, which may be exported. If a difference ariſes between the king and any foreign ſtate, the merchants of that ſtate are allowed ſix months time to ſell their effects and leave the kingdom; during which time they are to remain free and unmoleſted in their perſons and goods. See the articles COMMERCE, and *Mercantile Law*.

MERCHET (MERCHETUM), a fine or compoſition paid by inferior tenants to the lord, for liberty to diſpoſe of their daughters in marriage. No baron, or military tenant, could marry his ſole daughter and heir, without ſuch leave purchaſed from the king, *pro*

Mercia. *maritanda filia* And many of our servile tenants could neither send their sons to school, nor give their daughters in marriage, without exprefs leave from the fuperior lord. See Kennet's Gloffary *in Maritagium*. See alfo MARCHET.

MERCIA, the name of one of the feven kingdoms founded in England by the Saxons. Though the lateft formed, it was the largeft of them all, and grew by degrees to be by far the moft powerful. On the north it was bounded by the Humber and the Merfey, which feparated it from the kingdom of Northumberland; on the eaft by the fea, and the territories of the Eaft-Angles and Saxons; on the fouth by the river Thames; and on the weft by the rivers Severn and Dee. It comprehended well nigh 17 of our modern counties, being equal in fize to the province of Languedoc in France; very little, if at all, lefs than the kingdom of Arragon in Spain; and fuperior in fize to that of Bohemia in Germany.

Penda is regarded as its firft monarch; and the kingdom is thought to derive its name from the Saxon word *merc*, which fignifies "a march, bound, or limit," becaufe the other kingdoms bordered upon it on every fide; and not from the river Merfey, as fome would perfuade us. Penda affumed the regal title A. D. 626, and was of the age of 50 at the time of his acceffion; after which he reigned near 30 years. He was of a moft furious and turbulent temper, breaking at different times with almoft all his neighbours, calling in the Britons to his affiftance, and fhedding more Saxon blood than had been hitherto fpilled in all their inteftine quarrels. He killed two kings of Northumberland, three of the Eaft-Angles, and compelled Kenwall king of the Weft-Saxons to quit his dominions. He was at length flain, with moft of the princes of his family, and a multitude of his fubjects, in a battle fought not far from Leeds, by Ofwy king of Northumberland This battle, which the Saxon chronicle tells us was fought at Winwidfield, A. D. 655, made a great change in the Saxon affairs, which the unbridled fury of Penda had thrown into great confufion. He had the year before killed Anna king of the Eaft-Angles in battle, whofe brother Ethelred notwithftanding took part with Penda. On the other hand, Penda the eldeft fon of Penda, to whom his father had given the ancient kingdom of the Mid-Angles, had two years before married the natural daughter of King Ofwy, and had been baptized at his court. At that time it fhould feem that Ofwy and Penda were upon good terms; but after the latter had conquered the Eaft-Angles, he refolved to turn his arms againft the kingdom of Northumberland. Ofwy by no means had provoked this rupture; on the contrary, Bede tells us that he offered large fums of money, and jewels of great value, to purchafe peace: thefe offers being rejected, he was reduced to the neceffity of deciding the quarrel by the fword. The river near which the battle was fought overflowing, there were more drowned than killed. Amongft thefe, as the Saxon chronicle fays, there were 30 princes of the royal line, fome of whom bore the title of *kings*; and alfo Ethelred king of the Eaft-Angles, who fought on the fide of Penda againft his family and country.

His fon Penda, who married the daughter of that conqueror, became a Chriftian, and was not long after murdered, as is faid, by the malice of his mother. His brother Wolfher becoming king of Mercia, embraced in procefs of time the faith of the Gofpel, and proved a very victorious and potent monarch; and is, with no fewer than feven of his immediate fucceffors, commonly ftyled *king of the Anglo-Saxons*, though none of them are owned in that quality by the Saxon chronicle. But though poffibly none of them might enjoy this honour, they were undoubtedly very puiffant princes, maintaining great wars, and obtaining many advantages over the fovereigns of other Saxon ftates, and efpecially the Eaft-Angles, whom they reduced. The extent of the Mercian territories was fo ample as to admit, and fo fituated as to require, the conftituting fubordinate rulers in feveral provinces: to whom, efpecially if they were of the royal line, they gave the title of *kings;* which occafions fome confufion in their hiftory. Befides the eftablifhing epifcopal fees and convents, the Saxon monarchs took other methods for improving and adorning their dominions; and as Mercia was the largeft, fo thefe methods were moft confpicuous therein. Coventry, as being fituated in the centre, was ufually, but not always, the royal refidence. Penda, who was almoft continually in a ftate of war, lived as his military operations directed, in fome great town on the frontiers. Wolfher built a caftle or fortified palace for his own refidence, which bore his name.—Offa kept his court at Sutton Walls near Hereford.

In each of the provinces there refided a chief magiftrate; and if he was of the royal blood, had ufually the title of *king*. Penda, at the time he married Ofwy's daughter, had the title of *king of Leicefter*.—Ethelred made his brother Merowald king of Hereford; who, dying without iffue, bequeathed it to his younger brother Mercelm. The like honours were fometimes conferred upon the princeffes; and hence, in Mercia efpecially, we occafionally read of *vice-queens*. By thefe means the laws were better executed, the obedience of the fubjects more effectually fecured, and the fplendor of thefe refidences conftantly kept up and augmented.

At length, the crown devolving fometimes on minors and fometimes on weak princes, inteftine factions alfo prevailing, the force of this hitherto mighty kingdom began fenfibly to decline. This falling out in the days of Egbert, the moft prudent as well as the moft potent monarch of the Weft-Saxons, he took advantage of thefe circumftances; and having encouraged the Eaft-Angles to make an attempt for the recovery of their independence, he, in a conjuncture every way favourable to his defign, broke with the Mercians, and after a fhort war obliged them to fubmit. But this was not an abfolute conqueft, the kings of Mercia being allowed by him and his fucceffors to retain their titles and dominions, till the invafion of the Danes put an end to their rule, when this kingdom had fubfifted above 250 years; and when the Danes were afterwards expelled by the Weft-Saxons, it funk into a province, or rather was divided into many.

Mercia ‖ Mercurials.

MERCURIAL, fomething confifting of, or relating to, mercury.

MERCURIALIS (Jerom), an eminent Italian phyfician

Mercurialis. physician, born at Forli in 1530, where he first practised; but afterwards was professor of medicine successively at Padua, Bologna, and Pisa. His writings in physic are very numerous; besides giving an edition of Hippocrates in Greek and Latin, with notes, which, however, did not answer the expectations of the learned. He died in 1606; and in 1644 some select pieces of his were published at Venice in one volume folio.

MERCURIALIS, MERCURY, in botany: A genus of the enneandria order, belonging to the dioecia class of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The calyx of the male is tripartite; there is no corolla, but nine or twelve stamina; the antheræ globular and twin. The female calyx is tripartite; there is no corolla, but two styles; the capsule bicoccous, bilocular, and monospermous. There are three species. 1. The annua, or French mercury, with spiked flowers, male and female. This is an annual plant, with a branching stalk about a foot high, garnished with spear-shaped leaves of a pale or yellowish green colour. The male plants have spikes of herbaceous flowers growing on the top of the stalks: these fall off soon; but the female plants, which have testiculated flowers proceeding from the side of the stalks, are succeeded by seeds, which, if permitted to scatter, will produce plenty of plants of both sexes. 2. The perennis mountain, or dog's mercury, with spiked and testiculated flowers, grows under hedges and in woods in many parts of Britain. This has a perennial root, which creeps in the ground; the stalks are single, and without branches, rising 10 or 12 inches high, garnished with rough leaves, placed by pairs at each joint, of a dark green colour, indented on their edges: these have their male flowers growing in spikes, upon different plants from those which produce seeds. 3. The tomentosa, or shrubby hairy mercury, is a native of the south of France, Spain, and Italy. It has a shrubby branching stalk, growing a foot and an half high, garnished with oval leaves placed by pairs, and covered with a white down on both sides. The male flowers grow in short spikes from the side of the stalks upon different plants from the first. All the species are easily propagated by seeds, and are apt to become troublesome weeds where they have once got a footing.

Properties. The perennis, according to Mr Lightfoot, is of a soporific deleterious nature, noxious both to man and beast. There are instances of those who have eaten it by mistake instead of chenopodium, bonus Henricus, or English mercury, and have thereby slept their last. In the isle of Skye, it is called *lusglen-bracadale;* and an infusion of it is sometimes taken to bring on a salivation; but our author knows not how the experiment answers. Tournefort informs us, that the French make a syrup of the juice of the annua, two ounces of which is given as a purge; and that they use it in pessaries and clysters, mixing one quantity of honey to one and a half of the juice. Mr Withering differs greatly from Lightfoot concerning the qualities of the perennis. "This plant (says he), dressed like spinach, is very good eating early in the spring, and is frequently gathered for that purpose; but it is said to be hurtful to sheep. Mr Ray relates the case of a man, his wife, and three children, who experienced highly deleterious effects from eating it fried with bacon; but this was probably when the spring was more advanced, and the plant become acrimonious. Steeped in water, it affords a fine deep blue colour. Sheep and goats eat it; cows and horses refuse it.

Mercurification, Mercury.

MERCURIFICATION, in metallurgic chemistry, the obtaining the mercury from metallic minerals in its fluid form. For the effecting this, those who have been engaged in these researches have proposed three methods. The first is by means of a certain mercury, so prepared as to have a dissolving power, by which it could take up the mercuries of metals in the same manner as water dissolves salt from ashes. The second is by means of certain regenerating salts, such as sal ammoniac, which are to detain the more earthy parts of metals, and leave their mercuries separate or separable from them by sublimation or otherwise; and the third method is by means of a large lens or burning-glass, in the focus whereof, if any metal be applied, its mercurial part is said to separate and go off in fume, which when collected and condensed, appears to be running mercury.

The first of these methods would be very easy if the proper mercury were to be readily produced; the second is extremely laborious, and requires much patience and reiteration. But the third seems easy enough, and practicable to advantage, when a glass of three or four feet in diameter is at hand, the sky serene, and the sun shines strong.

For other processes, the reader may consult Junker's Conspectus Chemiæ. But these mercurified metals, or their mercurial principle rendered sensible, are a kind of philosophical mercury, which, although they resemble ordinary mercury, are nevertheless said by persons exercised in such studies, to differ from it considerably, by having a greater specific gravity, by more effectually penetrating and dissolving metals, by a stronger adhesion to these, and by a less volatility.

MERCURY, in natural history. See CHEMISTRY, *Index*. See also METALLURGY, and QUICKSILVER.

The use of mercury in medicine seems to have been little known before the 15th century. The ancients looked upon it as a corrosive poison, tho' of itself perfectly void of acrimony, taste, and smell: there are examples of its having been lodged for years in cavities both in bones and fleshy parts, without its having injured or affected them. Taken into the body in its crude state, and undivided, it passes through the intestines unchanged, and has not been found to produce any considerable effect. It has indeed been recommended in asthmas and disorders of the lungs; but the virtues attributed to it in these cases have not been warranted by experience.

Notwithstanding the mildness and inactivity of crude quicksilver undivided; yet, when resolved by fire into the form of fume, or otherwise divided into very minute particles, and prevented from re-uniting by the interposition of proper substances, or combined with mineral acids, it has very powerful effects; affording the most violent poisons, and the most excellent remedies with which we are acquainted.

The mercurial preparations, either given internally or introduced into a habit by external application, seem

Mercury. seem to forward circulation through even the minutest and most remote vessels of the body; and may be so managed as to promote excretion through all the emunctories. Hence their common use in inveterate chronic disorders, and obstinate obstructions of the excretory glands; in scrophulous and cutaneous diseases; and in the venereal lues. If their power be not restrained to certain emunctories, they tend chiefly to affect the mouth; and occasion a plentiful evacuation from the salival glands.

The salutary effects of mercurials do not depend on the quantity of sensible evacuation. This medicine may be gradually introduced into the habit, so as, without occasioning any remarkable discharge, to be productive of very happy effects. To answer this purpose, it should be given in very small doses, in conjunction with such substances as determine its action to the kidneys or the pores of the skin. By this method, inveterate cutaneous and venereal distempers have been cured, without any other sensible excretion than a gentle increase of perspiration or urine. Where there are ulcers in any part, they discharge for some time a very fetid matter, the quantity of which becomes gradually less, and at length the ulcer kindly heals. If the mercury should at any time, from cold, or the like, affect the mouth, it may be restrained by omitting a dose, and by warmth, or suitable medicines promoting the perspiration.

Cooling purgatives are also often employed with advantage; but perhaps the most effectual means of giving with safety a sudden check to a mercurial salivation, is by the application of a large blister to the back.

Mercury, as used in medicine, has been employed in a vast variety of different forms. But there is reason to believe, that every useful purpose to be answered by mercury may be obtained from a very few. The mercurial preparations in general, with a view to their use both externally and internally, may be divided into two great classes, the mild and the acrid. Almost every purpose to be answered by the former, may be accomplished by the unguentum hydragyri and pilulæ ex hydrargyro of the London and Edinburgh pharmacopœias; while most of the effects to be obtained from the latter may be derived from the proper use of those preparations, hitherto generally known under the title of *calomel*, and *corrosive sublimate mercury*.

The marks of pure mercury are, its globules not losing their spherical figure when poured on wood; its not communicating a tinge to water, or sweetness to vinegar, when rubbed with them; its evaporating entirely in an iron spoon over the fire; and its having a shining appearance without any pellicle on its surface. Mercury is best purified by distillation in an iron pot, with a long neck bent and immersed in vinegar.

Quicksilver has sometimes been used in its pure metallic state, with the view of removing obstructions in the alimentary canal, from an idea that it would operate by its weight. But it is seldom attended with a good effect, and sometimes it must do harm.

Whole volumes have been written respecting its operation and use in different diseases, and particularly in venereal affections. Some refer its operation to an evacuant power, others to its operating as a peculiar stimulus, and a third set to its possessing a power of destroying or neutralizing the venereal virus. Of these opinions, the latter is the most generally received, and perhaps the best founded. But for a more full view of the controversy, we may refer our readers to late publications on the venereal disease, and on mercury, by Mr John Hunter, Dr Schwediauer, and Dr Duncan.

In virulent gonorrhœa, it is doubted whether mercury be necessary. This disease is commonly treated like any similar inflammation: and the chief things attended to are cleanliness of the parts, a regular belly, and an abstinence from every thing stimulant in food, drink, &c. An injection of oil with calomel, or white precipitate, is much used, and some prefer a watery solution of opium. The more active injections have sometimes very disagreeable consequences.

When the constitution is affected, which is known by ulcers on the glands, buboes, ulcers in the mouth or throat, copper-coloured spots and ulcers on the surface, nodes, &c. mercury is thrown into the body either by friction or by the mouth. The general rule is, to keep up a slight soreness of the gums for some short time after the symptoms disappear; at the same time it is to be remembered, that mercury sometimes continues gleets, and induces ulcers, that are difficultly distinguished from venereal ones; and that these last only yield to warm bathing, diaphoretic diluents, opiates, country air, and milk diet. Corrosive sublimate is sometimes used, as more speedily arresting disagreeable, spreading, or dangerous ulcers; but the completion of the cure should always be trusted to the mild preparations alone. Mercury is also used in rabies canina, in worms, in hydrocephalus internus, in tetanus, and is by some considered as an antidote to the variolous matter.

Mercury, in the heathen mythology. See Hermes.

Most of the actions and inventions of the Egyptian Mercury have likewise been ascribed to the Grecian, who was said to be the son of Jupiter and Maia, the daughter of Atlas. No one of all the heathen divinities had so many functions allotted to him as this god: he had constant employment both day and night, having been the common minister and messenger of the whole Pantheon; particularly of his father Jupiter, whom he served with indefatigable labour, and sometimes indeed in a capacity of no very honourable kind. Lucian is very pleasant upon the multitude of his avocations; and, according to the confession of the emperor Julian, Mercury was no hero, but rather one who inspired mankind with wit, learning, and the ornamental arts of life, than with courage. The pious emperor, however, omits some of his attributes; for this god was not only the patron of trade, but also of theft and fraud.

Amphion is said, by Pausanias, to have been the first that erected an altar to this god; who, in return, invested him with such extraordinary powers of music (and masonry), as to enable him to fortify the city of Thebes in Bœotia, by the mere sound of his lyre.

Horace gives us the best part of his character.

Thou god of wit, from Atlas sprung,
Who by persuasive pow'r of tongue,

And

And graceful exercife, refin'd
The favage race of human kind,
Hail! winged meffenger of Jove,
And all th' immortal pow'rs above.
Sweet parent of the bending lyre,
Thy praife fhall all its founds infpire.
Artful and cunning to conceal
Whate'er in fportive theft you fteal,
When from the god who gilds the pole,
E'en yet a boy, his herds you ftole;
With angry voice the threat'ning pow'r
Bade thee thy fraudful prey reftore;
But of his quiver too beguil'd,
Pleas'd with the theft, Apollo fmil'd.
You were the wealthy Priam's guide,
When fafe from Agamemnon's pride,
Through hoftile camps, which round him fpread
Their watchful fires, his way he fped.
Unfpotted fpirits you confign
To blifsful feats and joys divine;
And, pow'rful, with thy golden wand,
The light, unbodied crowd command;
Thus grateful does thy office prove
To gods below, and gods above. *Francis.*

This ode contains the fubftance of a very long hymn to Mercury, attributed to Homer. Almoft all the ancient poets relate the manner in which the Grecian Mercury difcovered the lyre; and tell us that it was an inftrument with feven ftrings; a circumftance which makes it effentially different from that faid to have been invented by the Egyptian Mercury, which had but three. However, there have been many claimants befides Mereury to the feven-ftringed lyre. See Lyre.

His moft magnificent temple was on mount Cylene, in Arcadia. He is defcribed by the poets as a fair beardlefs youth, with flaxen hair, lively blue eyes, and a fmiling countenance. He has wings fixed to his cap and fandals, and holds the caduceus (or ftaff furrounded with ferpents with two wings on the top) in his hand; and is frequently reprefented with a purfe, to fhow that he was the god of gain. The animals facred to him, were the dog, the goat, and the cock. In all the facrifices offered to him, the tongues of the victims were burnt; and thofe who efcaped imminent danger facrificed to him a calf with milk and honey.

Mercury, ☿ in aftronomy. See Astronomy, *Index*.

This planet is brighteft between his elongations and fuperior conjunction, very near to which laft he can generally be feen. He becomes invifible foon after he has found his elongation, going towards his inferior conjunction; and becomes vifible again a few days before his next elongation The brightnefs of this planet alters fometimes very confiderably in 24 hours. It has been obferved when lefs than three degrees diftant from the fun, and may, perhaps, fometimes be feen even in conjunction with it.

Mercury and Venus appear brighteft and moft beautiful in the oppofite parts of their orbits: the firft, between his elongations and fuperior conjunction; and the other, between her elongations and inferior conjunction. Therefore, Venus is feen in great perfection as a crefcent, particularly in her inferior conjunction, whilft Mercury is feldom feen in fuch perfect phafes. Mercury fhould be always obferved on or near the meridian. When fartheft from the fun, he always appears with a very faint light; and when he has a great fouth declination, or the atmofphere is not perfectly clear, he feldom can be feen in thofe parts of his orbit, where he only begins to recover his brightnefs, or where it is much diminifhed. He has frequently been feen on the meridian even with a fmall telefcope and fmall power; and it appears from the above ftatement that he may be obfcured in a clear day rather more than half his orbit, or near one hundred and fourfcore days in the year.

Mercury, in heraldry, a term ufed in blazoning by planets, for the purple colour ufed in the arms of fovereign princes.

MERCY, a virtue that infpires us with compaffion for our brethren, and which inclines us to give them affiftance in their neceffities. Mercy is alfo taken for thofe favours and benefits that we reeeive either from God or man, particularly in the way of forgivenefs of injuries or of debts. Nothing can be more beautiful than the defcription of mercy given us by Shakefpear, in the pleading between Portia and the Jew:

Por. Then muft the Jew be merciful.
Shy. On what compulfion muft I? tell me that.
Por. The quality of mercy is not ftrain'd;
It droppeth as the gentle rain from heav'n
Upon the place beneath. It is twice blefs'd:
It bleffeth him that gives, and him that takes.
'Tis mightieft in the mightieft; it becomes
The throned monarch better than his crown:
The fceptre fhows the force of temporal power,
The attribute to awe and majefty,
Wherein doth fit the dread and fear of kings;
But mercy is above this fcepter'd fway,
It is enthroned in the hearts of kings;
It is an attribute to God himfelf,
And earthly power doth then fhow likeft God's,
When mercy feafons juftice. Therefore, Jew,
Though juftice be thy plea, confider this,
That in the courfe of juftice none of us
Should fee falvation. We do pray for mercy;
And that fame prayer doth teach us all to render
The deeds of mercy. *Merchant of Venice*, act iv.

MERCY-SEAT, or Propitiatory, in Jewifh antiquity, the covering of the ark of the covenant.—The Hebrew name of this cover, which we tranflate mercy-feat, is *Capporeth* (Exod. xxv. 17. 22.), from *Cappor*, which fignifies *to cover*, *to fhut up*, *to expiate*, *to pay*. This cover was of gold, and at its two ends were fixed the two cherubims of the fame metal, which by their wings extended forwards, feemed to form a throne for the majefty of God, who in fcripture is reprefented to us as fitting between the cherubims, and the ark itfelf was as it were his footftool. It was from hence that God gave his oracles to Mofes, or to the high prieft that confulted him, (Exod. xxv. 22. Numb. vii. 89.)

MERETRIX, among the Romans, differed from the *proftibula*. The *proftibulæ* were common courtezans, with bills over their doors, fignifying their profeffion, and

Merganser. Mergus. and were ready at all times to entertain cuftomers; whereas the *meretrices* entertained none but at night.—The *meretrices* differed in their drefs from the *matrons*; the former wore the *toga* and fhort *tunics*, like thofe of the men: the latter wore the *palla* and the *ftola* of fuch a length as to reach to their feet.

MERGANSER. See Mergus.

MERGUS, in ornithology, a genus of birds of the order of anferes; diftinguifhed by having the beak of a cylindrical figure, and hooked at the extremities, and its denticulations of a fubulated form.

1. The cucullatus, or crefted diver of Catefby, has a globular creft, white on each fide; and the body is brown above and white below. This elegant fpecies inhabits North America. It appears at Hudfon's Bay the end of May, and builds clofe to the lakes.—The neft is compofed of grafs, lined with feathers from the breaft; the number of eggs from four to fix. The young are yellow, and are fit to fly in July.—They all depart from thence in autumn. They appear at New York, and other parts as low as Virginia and Carolina, in November, where they frequent frefh-waters. They return to the north in March; and are called at Hudfon's Bay *Omifka fheep*. Plate CCXCIV.

2. The merganfer, or goofander, weighs four pounds: its length is two feet four inches; the breadth three feet four. The bill is three inches long, narrow, and finely toothed or ferrated; the colour of that and of the irides is red. The *dun-diver*, or female, is lefs than the male: the head and upper part of the neck is ferruginous; the throat white: the feathers on the hind part are long, and form a pendent creft: the back, the coverts of the wings, and the tail, are of a deep afh-colour: the greater quill-feathers are black, the leffer white; the breaft and middle of the belly are white, tinged with yellow. The goofander feems to prefer the more northern fituations to thofe of the fouth, not being feen in the laft except in very fevere feafons. It continues the whole year in the Orkneys; and has been fhot in the Hebrides in fummer. It is common on the continent of Europe and Afia, but moft fo towards the north. It is found alfo in Iceland and Greenland, and breeds there, retiring fouthward in winter, at which time it is found about the lake Baikal. It is frequent in America; inhabits the province of New York in winter; retires from thence in April, probably to Hudfon's Bay; and, if it be the bird called a *Fifherman-duck*, found alfo in Carolina.

3. The ferrator, or red-breafted merganfer, weighs about two pounds: the length is one foot nine inches, the breadth two feet feven; the bill is three inches long; the lower mandible red; the upper dufky; the irides a purplifh red: head and throat a fine changeable black and green: on the former a long pendent creft of the fame colour; the tail fhort and brown; the legs orange-coloured The head and upper part of the female are of a deep rufh-colour, and the tail afh-coloured. Thefe birds are moft frequent in the northern parts of Great Britain. They are obferved to breed on Loch Mari, in the county of Rofs, and in the ifle of Iflay. The fpecies is common in moft parts of the north of Europe, on the continent; and as high as Iceland, where it is called *Vatus-ond*: alfo in the Ruffian dominions, about the great rivers of Sibiria, and the lake Baikal. It is likewife frequent in Greenland in the fummer, where it breeds on the fhores. The eggs are like thofe of a wild duck, but fmaller and whiter. It dives well, and is very active in the water; but the Greenlanders often take it by darts thrown at it, efpecially in Auguft, being the time when it is in moult. It is frequent in Newfoundland, and often appears at Hudfon's Bay in large flocks, but is obferved to be of a larger fize there than in Europe. They generally come in pairs the beginning of June, as foon as the ice breaks up; make the neft foon after their arrival, chiefly on dry fpots of ground in the iflands, and lay from eight to thirteen white eggs, the fize of thofe of a duck: the neft made of withered grafs, and lined with the down of the breaft. The young are of a dirty brown, like young goflings. They all depart fouth in October to the lakes, where they may have open water. They are known at Hudfon's Bay by the name of *As-fick*. Mergus. Merian.

4. The albellus, or fmew, weighs about 34 ounces: the length 18 inches, the breadth 26; the bill is near two inches long, and of a lead colour; the head is adorned with a long creft, white above and black beneath: the head, neck, and whole under part of the body, are of a pure white; the tail is of a deep afh-colour, the legs a bluifh grey. The female, or *lough diver*, is lefs than the male: the back, the fcapulars, and the tail, are dufky; the belly is white. The fmew is feen in England only in winter, at which feafon it will fometimes be met with at the fouthern parts of it; as alfo in France, in the neighbourhood of Picardy, where it is called la Piette: fimilar to this, we have heard it called in Kent by the name of *Magpie-diver*. On the continent we find it as far fouth as Carniola; frequents alfo Iceland, at which place, or fome other arctic region, it paffes the fummer; and where it in courfe breeds, probably along with the other Merganfers; as it has been obferved to migrate, in company with thofe birds, feveral kinds of ducks, &c. in their courfe up the Wolga, in February. It alfo inhabits America, having been fent from New-York, where it is probably a migratory fpecies, as in Europe.

5. The minutus, or redheaded fmew, weighs about 15 ounces; the length one foot four inches, the breadth one foot eleven: the bill is of a lead colour: the head flightly crefted, and of a ruft colour: the hind part of the neck is of a deep grey, the forepart clouded with a lighter colour of the fame kind: the back and tail are of a dufky afh-colour, the legs of a pale afh-colour.—It is a native of Europe. Birds of this genus (Mr Latham obferves) "are in general not fo well-flavoured as thofe of the duck kind; yet we have often met with the laft fpecies in the London markets, and by fome they are thought to be very little inferior to the wild duck; which laft now and then partakes of the *fifhy haut gout*, a flavour not difagreeable to the palates of the connoiffeurs in good eating."

MERIAN (Maria Sibylla), a celebrated paintrefs, born at Frankfort in 1647, was the daughter of Matthias Merian, a noted engraver and geographer.—As fhe fhowed a very early fondnefs for painting, fhe was inftructed by Abraham Mignon; from whom fhe learned great neatnefs of handling and delicacy of colour.

lour. Her genius particularly led her to paint reptiles, flowers, and insects, which she designed after nature, and studied every object with a most curious and inquisitive observation; so that her works rose every day more and more into reputation. Frequently she painted her subjects in water-colours on vellum, and finished an astonishing number of designs, as she was equally indefatigable in her work and in her inquiries into the curiosities of nature. She drew the flies and caterpillars in all the variety of changes and forms in which they successively appear from their quiescent state till they become butterflies; and also drew frogs, toads, serpents, ants, and spiders, after nature, with extraordinary exactness and truth. She even undertook a voyage to Surinam, to paint those insects and reptiles which were peculiar to that climate; and at her return to her own country published two volumes of engravings after her designs, which are well known to the curious. She died in 1717. Her daughter Dorothea Henrietta Graff, who painted in the same style, and had accompanied her mother to Surinam, published a third volume collected from the designs of Sibylla; which complete work has been always admired by the learned, as well as by the professors of painting.

MERIDA, a strong town of Spain, in Estremadura, built by the Romans before the birth of Christ. Here are fine remains of antiquity, particularly a triumphal arch, but not now what it was formerly. It is seated in an extensive and fertile plain, 47 miles east of Elva, and 45 south by east of Alcantara. W. Lon. 6.4. N. Lat. 38.42.

MERIDA, a town of North America, in New Spain, and capital of the province of Yutacan, where the bishop and the governor of the province reside. It is inhabited by Spaniards and native Americans; is 30 miles south of the sea, and 120 N. E. of Campeachy. W. Lon. 89. 25. N. Lat. 20. 15.

MERIDA, a town of South America, in the kingdom of New Granada, seated in a country abounding with all kinds of fruits, 130 miles N. E. of Pampeluna. W. Lon. 71. 0. N. Lat. 8. 30.

MERIDEN, or MIREDEN, a town of Warwickshire, 97 miles from London, in the London road, near Coventry. It is pleasantly situated, though in a wet clayey situation, and is not ill built. The church stands on an elevated spot, and contains some good monuments. There is an inn here, about half way from St Clement's forest to Coventry, one of the finest in this part of England, being built like a nobleman's seat.

MERIDIAN, in geography, a great circle supposed to be drawn through any part on the surface of the earth, and the two poles; and to which the sun is always perpendicular at noon. See GEOGRAPHY.

In astronomy, this circle is supposed to be in the heavens, and exactly perpendicular to the terrestrial one. See ASTRONOMY.

MERIDIANI, in antiquity, a name which the Romans gave to a kind of gladiators who entered the arena about noon after the bestiarii (who fought in the morning against beasts) had finished. They were thus called from *meridies*, i. e. *noon*, the time when they exhibited their shews. The meridiani were a sort of artless combatants, who fought man with man, sword in hand. Hence Seneca takes occasion to observe, that the combats of the morning were full of humanity compared with those which followed.

MERIDIONAL DISTANCE, in navigation, the same with departure, or easting and westing; being the difference of longitude between the meridian, under which the ship now is, and any other meridian which she was under before.

MERIDIONAL parts, miles, or minutes, in navigation, are the parts by which the meridians in a Mercator's chart do increase, as the parallels of latitude decrease.

MERIONETHSHIRE, a county of North-Wales, is bounded on the north by Caernarvonshire and Denbighshire; on the east by Montgomeryshire; on the west by St George's channel, or the Irish sea; and on the south by the river Dyffi, which parts it from Cardiganshire; extending 40 miles in length and 36 in breadth. It is divided into six hundreds, in which are four market-towns, 37 parishes, about 2590 houses, and 17,100 inhabitants. It lies in the diocese of Bangor, and sends one member to parliament. The air is very sharp in winter, on account of its many high barren mountains; and the soil is as bad as any in Wales, it being very rocky and mountainous. However, this county feeds large flocks of sheep, many goats, and large herds of horned cattle, which find pretty good pasture in the valleys. Besides these, among their other commodities may be reckoned Welch cotton, deer, fowl, fish, and especially herrings, which are taken on this coast in great plenty.

MERIT, signifies *desert*. This term is more particularly applied to signify the moral goodness of the actions of men, and the rewards to which those actions intitle them.

MERLIN (Ambrose), a famous English poet and reputed prophet, flourished at the end of the 5th century. Many surprising and ridiculous things are related of him. Several English authors have represented him as the son of an incubus, and as transporting from Ireland to England the great stones which form Stonehenge on Salisbury plain. Extravagant prophecies and other works are also attributed to him, on which some authors have written commentaries.

MERLIN, in ornithology. See FALCO.

MERLON, in fortification, is that part of a parapet which is terminated by two embrasures of a battery.

MERLUCIUS, the HAKE, in ichthyology. See GADUS.

MERMAID, or MERMAN, a sea-creature frequently talked of, supposed half human and half a fish.

However naturalists may doubt of the reality of *mermen* or *mermaids*, we have testimony enough to establish it; though, how far these testimonies may be authentic, we cannot take upon us to say. In the year 1187, as Laray informs us, such a monster was fished up in the county of Suffolk, and kept by the governor for six months. It bore so near a conformity with man, that nothing seemed wanting to it but speech. One day it took the opportunity of making its escape; and plunging into the sea, was never more heard of. *Hist. de Angleterre*, P. I. p. 403.

In the year 1430, after a huge tempest, which broke down the dikes in Holland, and made way for the

Mermaid,
||
Merodach.

the sea into the meadows, &c. some girls of the town of Edam in West-Freezeland, going in a boat to milk their cows, perceived a mermaid embarrassed in the mud, with a very little water. They took it into their boat, and brought it with them to Edam, dressed it in womens apparel, and taught it to spin. It fed like one of them, but could never be brought to offer at speech. Some time afterwards it was brought to Haerlem, where it lived for some years, though still showing an inclination to the water. Parival relates, that they had given it some notion of a Deity, and that it made its reverences very devoutly whenever it passed by a crucifix. *Delices de Hollande.*

In the year 1560, near the island of Manar, on the western coast of the island of Ceylon, some fishermen brought up, at one draught of a net, seven mermen and mermaids; of which several Jesuits, and among the rest F. Hen. Henriques and Dimas Bosquez, physicians to the viceroy of Goa, were witnesses. The physician, who examined them with a great deal of care, and made dissection thereof, asserts, that all the parts both internal and external were found perfectly conformable to those of men. See the *Hist. de la compagnie de Jesus*, P. II. T. IV. n° 276. where the relation is given at length.

We have another account of a merman, seen near the great rock called *Diamond*, on the coast of Martinico. The persons who saw it, gave in a precise description of it before a notary. They affirmed that they saw it wipe its hand over its face, and even heard it blow its nose.

Another creature of the same species was caught in the Baltic in the year 1531, and sent as a present to Sigismond king of Poland, with whom it lived three days, and was seen by all the court. Another very young one was taken near Rocca de Sintra, as related by Damian Goes. The king of Portugal and the grand master of the order of St James, are said to have had a suit at law to determine which party these monsters belong to.

In Pontopidan's Natural History of Norway, also, we have accounts of mermaids; but not more remarkable or any way better attested than the above.

MERNS, or KINCARDINSHIRE, a county of Scotland, stretching 27 miles in length and 20 in breadth, is bounded on the east by the German ocean, on the south by the river of North Esk, on the west by Angus, and on the north by the river Dee and Aberdeenshire. The country is pretty plain and level, fruitful in corn and pasturage, producing an infinite number of fir-trees, besides a great number of agreeable plantations; and along the sea-coasts there are many convenient creeks and harbours.—The people are Lowlanders, civil, hospitable, and industrious.—The name *Merns* is by some derived from that of a valiant nobleman, who, subduing the country, received it in reward from Kenneth II. Cambden supposes it to retain part of the ancient name of *Vernicones*. The other name is derived from *Kincardin*, its ancient capital, now an inconsiderable village. The stocking-trade employs the natives from the banks of the Dee to Stone-hive; from thence to the North Esk they are wholly employed in weaving.

MERODACH was an ancient king of Babylon, who was placed among the gods, and worshipped by the Babylonians. Jeremiah (chap. l. 2.), speaking of the ruin of Babylon, says, "Babylon is taken, Bel is confounded, Merodach is broken in pieces, her idols are confounded, her images are broken in pieces." We find certain kings of Babylon, in whose names that of Merodach is contained: for example, Evilmerodach and Merodach-baladan. Evilmerodach was the son of Nebuchadnezzar the Great, and had for his successor the wicked Belshazzar. Merodach-baladan, son of Baladan king of Babylon, having heard that Hezekiah had been cured miraculously (Isa. xxxix.), and that the sun had gone backwards to give him an assurance of his recovery, sent him presents, and made him compliments upon the recovery of his health. Ptolemy calls him *Mardocempadus*; and says, that he began to reign at Babylon 26 years after the beginning of the era of Nabonassar, that is, in the year of the world 2283.

Meroe.

MEROE (anc. geog.), an island of Ethiopia beyond Egypt, in the Nile; with a cognominal town, the metropolis of the Ethiopians.

The Jesuits have endeavoured to prove, that the province of Gojam in Abyssinia is the Meroë of the ancients; but this is strongly contested by Mr Bruce, who is of opinion that it must be looked for somewhere between the source of the Nile and its union with the Atbara. The latter, he thinks, is very plainly the Astaboras of the ancients; and Pliny says that this stream incloses the left side of Meroë as the Nile does the right, in which case we must suppose him looking southward from Alexandria, otherwise the words would not apply.

We are told by Diodorus Siculus, that Meroë had its name from a sister of Cambyses king of Persia, who died there in the expedition undertaken by that prince against the Ethiopians. His army perished with hunger and thirst in the deserts beyond Meroë; which could not have happened if they had reached Gojam, the latter being one of the most plentiful countries in the world. A further proof that Gojam cannot be the ancient Meroë is, that the latter was inclosed between the rivers Nile and Astaboras, while Gojam is almost entirely surrounded by the Nile. If the ancients were acquainted with Gojam, they must also have been acquainted with the fountains of the Nile, which we certainly know they were not. Pliny says that Meroë, the most considerable of all the islands of the Nile, was called *Astaboras*, from the name of its left channel, which cannot be supposed any other than the junction of the Nile and Atbara. He informs us moreover, that the sun was vertical twice in the year, *viz.* when proceeding northward he entered the 18th degree of Taurus, and when returning he came to the 14th degree of Leo; but this could never be the case with Gojam, which lies in about 10 degrees north latitude.

Again the poet Lucan describes Meroë by two circumstances which cannot apply to any other than the peninsula of Athara. One is, that the inhabitants were black; which was the case with the Gymnosophists and first inhabitants, and which has been the case with all the rest down to the Saracen conquest: but the inhabitants of Gojam, as well as the other Abyssinians, are fair, at least greatly different in complexion from the blacks; they are also long haired.

and

Meroe, Merom.

and nobody imagined that they ever had philosophers or science among them, which was eminently the case with the ancient inhabitants of Meroë. The other circumstance is, that the ebony tree grew in the island of Meroë, which at this day grows plentifully in the peninsula of Atbara, and part of the province of Kuara, but not in Gojam, where the tree could not subsist on account of the violent rains which take place during six months of the year. Mr Bruce mentions another circumstance quoted from the poet Lucan, which likewise tends to prove the identity of Meroë and Atbara; viz. that though there are many trees in it, they afford no shade. This our traveller found by experience, when returning from Abyssinia through Atbara. "The country (says he) is flat, and has very little water. The forest, though thick, afforded no sort of shade, the hunters for the sake of their sport, and the Arabs for destroying the flies, having set fire to all the dry grass and shrubs; which passing with great rapidity in the direction of the wood from east to west, though it had not time to destroy the trees, did yet wither, and occasion every leaf that was upon them to fall, unless in those spaces where villages had been and where water was. In such spots a number of large spreading trees remained full of foliage; which from their great height and being cleared of underwood, continued in full verdure, loaded with large, projecting, and exuberant branches. But even here the pleasure that their shade afforded was very temporary, so as to allow us no time for enjoyment. The sun, so near the zenith, changed his azimuth so rapidly, that every few minutes I was obliged to change the carpet on which I lay, round the trunk of the tree to which I had fled for shelter; and though I lay down to sleep perfectly screened by the trunk or branches, I was presently awakened by the violent rays of a scorching sun, the shade having passed beyond me. In all other places, though we had travelled constantly in a forest, we never met with a tree that could shade us for a moment, the fire having deprived them of all their leaves." The heat of Atbara is excessive, the thermometer having been observed at $119\frac{1}{2}°$: two of Mr Bruce's company died of thirst, or at least of the consequences of drinking after extreme thirst. The inhabitants live in the greatest misery, and are continually in danger from the neighbouring Arabs, who, by destroying and burning their corn, are able to reduce them to a starving condition. Notwithstanding all their disadvantages, however, they have a manufacture of coarse cotton towels, of a size just sufficient to go round the waist, which pass current as silver money throughout the whole country.

MEROM, (anc. geog.) The waters of Merom, at which place Jabin and the other confederate kings met to fight Joshua (xi. 5.), are generally supposed by the learned to be the lake Semechon, which lies between the head of the river Jordan and the lake Gennesareth; since it is agreed on all hands, that the city Hazor, where Jabin reigned, was situated upon this lake. But others think, that the waters of Merom or Merome were somewhere about the brook Kishon, since there is a place of that name mentioned in the account of the battle against Sisera (Judg. v. 21.) And it is more rational to think, that the confederate kings advanced as far as the brook Kishon, and to a pass which led into the country, to hinder Joshua from penetrating it, or even to attack him in the country where he himself lay encamped, than to imagine that they waited for him in the midst of their own country; leaving all Galilee at his mercy, and the whole tract from the brook Kishon to the lake Semechon.

Merope, Merops.

MEROPE (fab. hist.) one of the Atlantides. She married Sisyphus the son of Æolus, and like her sisters was changed into a constellation after death. It is said that in the constellation of the Pleiades the star of Merope appears more dim and obscure than the rest, because she, as the poets observe, married a mortal, while her sisters married some of the gods or their descendants.

MEROPS (fab. hist.) a king of the island of Cos, who married Clymene, one of the Oceanides. He was changed into an eagle, and placed among the constellations. Also a celebrated soothsayer of Percosus in Troas, who foretold the death of his sons Adrastus and Amphius, who were engaged in the Trojan war. They slighted their father's advice, and were killed by Diomedes.

MEROPS, in ornithology, a genus belonging to the order of picæ. The bill is crooked, flat, and carinated; the tongue is jagged at the point; and the feet are of the walking kind. 1. The apiaster, or bee-eater, has an iron-coloured back; the belly and tail are of a bluish green; and the throat is yellow. This bird inhabits various parts of Europe, on the continent, though not in England; yet is said to have been seen in Sweden, and flocks of them have been met with at Anspach in Germany in the month of June. They are now and then seen in Lorraine, though only in pairs; and are not unfrequent in other parts, since Kramer talks of their building the nest in the sandy crags of the Danube. They are met with in Italy and the south of France; and in Candia and other islands of the Mediterranean, they are in plenty, as well as in Palestine and Arabia, being very common in the woods about Yemen, where they are called Schæghagha. It takes the name of *bee-eater* from its being very fond of those insects; but, besides these, it will catch gnats, flies, cicadæ, and other insects, on the wing, like the swallow. Willoughby tells us, from Belon, "that its singular elegancy invites the Candy boys to hunt for it with cicadæ, as they do for those greater swallows called *swifts*, after this manner:—Bending a pin like a hook, and tying it by the head to the end of a thread, they thrust it through a cicada (as boys bait a hook with a fly), holding the other end of the thread in their hands: the cicada, so fastened, flies nevertheless in the air; which the Merops spying, flies after it with all her force; and catching it, swallows pin and all, wherewith she is caught."—This bird is said to be in most plenty in the isle of Candia; and, in defect of insects, to eat seeds of many kinds; and Ray supposes, from its similarity to the kingsfisher, it may possibly feed on fish. Most probably some think it good to eat, as Willoughby saw many of them exposed for sale in the markets of Rome. These birds make their nests in deep holes in the banks of rivers, like the sand martin and kingsfisher, at the end of which the female lays from five to seven white eggs, rather less than those of a blackbird. The neſt itſelf is compoſed of moſs. 2. The viridis, or Indian bee-eater, is green, with a black belt on the breaſt; and the throat and tail are black. It inhabits Bengal. 3. The congener is yellowiſh, with a green rump. It inhabits the ſouth of Europe. 4. The ſuperciliosus is green, with a white line both above and below the eyes, and a yellow throat. It is found in Madagaſcar, where the natives give it the name of *Patirich Tirich*. 5. The cinereus is variegated with red and yellow, with the two longeſt quill-feathers of the tail red. It is a native of Mexico. 6. The erythropterus, or red-winged bee-eater, is in length ſix inches; the bill is one inch, and black: the upper parts of the head, body, wings, and tail coverts, are green brown, deepeſt on the head and back, lighteſt on the rump and tail coverts: behind the eye is a ſpot of the ſame, but of a very deep colour: the quills and tail are red, tipped with black; the laſt two inches in length: the throat is yellow; the under parts of the body are a dirty white; and the legs black.—This inhabits Senegal, from which place a well-preſerved ſkin was brought by M. Adanſon. (See fig. A.) 7. The wattled bee-eater (fig. B.) is the ſize of a cuckow, in length about $14\frac{1}{2}$ inches. The feathers on the upper part of the head, being longer than the reſt, give the appearance of a creſt; thoſe of the under part are ſmooth; the plumage for the moſt part is brown; the feathers are long and pointed, and each feather has a ſtreak of white down the middle; under the eye, on each ſide, is a kind of wattle, of an orange colour; the middle of the belly is yellow; the tail is wedge-ſhaped, ſimilar to that of the magpie, and the feathers are tipped with white; the bill and legs are brown.—This bird is ſuppoſed to be peculiar to New Holland. There are 14 or 15 other ſpecies.

Plate CCXCIV.

MEROVINGIAN CHARACTER, derives it name from Meroüée, the firſt king of France of that race, which reigned 333 years, from Pharamond to Charles Martel. This race is ſaid by ſome to have terminated in Childeric III. A. D. 751. There are many MSS. in the French libraries ſtill extant in this character.

MEROZ, (anc. geog.), a place in the neighbourhood of the brook Kiſhon, whoſe inhabitants refuſing to come to the aſſiſtance of their brethren when they fought with Siſera, were put under an anathema (Judges v. 23.) "Curſe ye Meroz, ſays the angel of the Lord; curſe ye bitterly the inhabitants thereof: becauſe, &c." Some have thought that Meroz is the ſame as Merrus or Merom; and this F. Calmet thinks the moſt probable opinion in this matter. Others will have it, that Meroz was a mighty man, who dwelt near the Kiſhon, and not caring to come to the aſſiſtance of Barak and Deborah, was excommunicated by the angel of the Lord by the ſound of 400 trumpets. The angel of the Lord, according to ſome, was Barak, the general of the Lord's army; but according to others he was the high-prieſt for the time being, or a prophet.

MERSA, a town of Barbary, pleaſantly ſituated about 11 miles from the city of Tunis, and two from Melcha the ſite of ancient Carthage. The Bey has here two country-houſes, one of them very coſtly work, built by Haſſan Bey ſurnamed the *Good*. From theſe are orange gardens reaching almoſt to the ſea-ſhore; on the edge of which is a famous well of ſweet water, eſteemed the beſt and lighteſt in the kingdom. Cloſe to this is a coffee-houſe, whether numbers of people from the neighbouring places reſort to drink coffee, and a glaſs of this natural luxury ſo peculiarly enjoyed in the eaſtern countries. In the middle of the court is a large mulberry-tree, under the ſhade of which they ſit and ſmoke and play at cheſs; inhaling the comfortable ſea-breeze that refreſhes this delightful ſpot. The water is drawn up by a camel with the Perſian wheel.

Here are the remains of an ancient port, or cothon, (ſuppoſed to be an artificial one), built by the Carthaginians after Sapii had blocked up the old port, nothing but the turret or light-houſe being left.

MERS or MERSE, a county of Scotland, called alſo *Berwickſhire*. This laſt name it derives from the town of Berwick, which was the head of the ſhire before it fell into the hands of the Engliſh, and obtained the appellation of *Mers* or *March*, becauſe it was one of the borders towards England. It is waſhed on the ſouth and eaſt by the river Tweed and the German Ocean, bounded on the weſt by Tweedale, and on the north by Lothian. It extends 24 miles from eaſt to weſt, and the breadth amounts to 16. The face of the country is rough and irregular, exhibiting hills, moors, and moſſes, with intermediate valleys, which are pleaſant and fruitful. It is watered by many ſtreams; and particularly by the famous Tweed, which, riſing from the ſame hills that give birth to the Clyde and Annan, runs with a rapid courſe through Tweedale foreſt and Teviotdale, and after a courſe of 50 miles diſembogues itſelf into the German Ocean. Notwithſtanding the length of its courſe, it is not navigable above Berwick, where there is a noble bridge over it, conſiſting of 15 arches. There is another fine one, called the *Union Bridge*, at Coldſtream. There is a third at Melroſe, a fourth at Peebles, and a fifth at Kelſo. The ſhire of Berwick is generally diſtinguiſhed into the three diviſions of Mers, Lammermuir, and Lauderdale. The Mers is low, pleaſant, and tolerably fruitful in corn. Lammermuir is a hilly country, abounding with game, and yielding good paſture for ſheep and black cattle. Lauderdale is a tract of land lying on each ſide of the river Lauder, agreeably varied with hill, dale, and foreſt, producing good ſtore of corn and paſturage, and giving the title of earl to the family of Maitland: but the moſt fruitful and populous parts of Berwickſhire, are thoſe that lie along the Tweed, and on both ſides of the leſſer rivers White Water, Black Water, and Eye. The ſeats of noblemen and gentlemen abound in this county.

MERSENNE (Marin), in Latin *Merſennus*, a learned French author, born at Oyſé, in the province of Maine, anno 1588. He ſtudied at La Fleche at the ſame time with Des Cartes; with whom he contracted a ſtrict friendſhip, which laſted till death. He afterwards went to Paris, and ſtudied at the Sorbonne; and in 1611 entered himſelf among the minims. He became well ſkilled in Hebrew, philoſophy, and mathematics. He was of a tranquil, ſincere, and engaging temper; and was univerſally eſteemed by perſons illuſtrious for their birth, their dignity, and their learning.

learning. He taught philofophy and divinity in the convent of Nevers, and at length became fuperior of that convent; but being willing to apply himfelf to ftudy with more freedom, he refigned all the pofts he enjoyed in his order, and travelled into Germany, Italy, and the Netherlands. He wrote a great number of excellent works; the principal of which are, 1. *Quæftiones celeberrimæ in Genefim.* 2 *Harmonicorum libri.* 3. *De fonorum natura, caufis, & effectibus.* 4. *Cogitata phyfico-mathematica.* 5. *La verité des Sciences.* 6. *Les queftions inouies.* He died at Paris in 1648. He had the reputation of being one of the beft men of his age. No perfon was more curious in penetrating into the fecrets of nature, and carrying all the arts and fciences to their utmoft perfection. He was in a manner the centre of all the men of learning, by the mutual correfpondence which he managed between them. He omitted no means to engage them to publifh their works; and the world is obliged to him for feveral excellent difcoveries, which, had it not been for him, would perhaps have been loft.

MERSEY, a river of England, that runs through the counties of Lancafter, York, and Chefter, and empties itfelf into the Irifh fea at Liverpool. By the late inland navigation, it has communication with the rivers Dee, Ribble, Oufe, Trent, Darwent, Severn, Humber, Thames, Avon, &c.; which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancafter, Weftmoreland, Chefter, Stafford, Warwick, Leicefter, Oxford, Worcefter, &c.

Mersey-Ifland, an ifland of Effex, at the mouth of the Coln, fouth of Colchefter. It was feized by the Danes in the reign of King Alfred, for their winter-quarters. It had eight parifhes, now reduced to two, viz. eaft and weft Merfey. The ifland had a block-houfe; and, in the Dutch war, the parliament put 1000 men in it.

MERULA (George), an Italian of extraordinary parts and learning, born at Alexandria in the duchy of Milan about the year 1420. He taught youth at Venice and Milan for 40 years, and laboured abundantly in reftoring and correcting ancient authors. He wrote, and addreffed to Lewis Sforza, *Antiquitates Vicecomitum;* or "The Actions of the Dukes of Milan," in 10 books; with fome other things in the fame way. His death, in 1494, is faid not to have grieved any body; as he lived in a ftate of war with, and abufed, almoft all his cotemporary fcholars.

MERULA (Paul), born at Dort in Holland, a famous lawyer, hiftorian, and linguift, was profeffor of hiftory in the univerfity of Leyden after Lipfius. He wrote, 1. Commentaries on Ennius; 2. The life of Erafmus and Junius; 3. A cofmography; 4. A treatife of law; and died in 1607.

Merula, or *Blackbird*, in ornithology. See Turdus.

MERUS, (anc. geog.), a mountain of the Hither India, hanging over the city Nyffa, built by Bacchus, and fituated between the rivers Cophen and Indus. The name, denoting the *thigh*, gave rife to the fable of Bacchus being inferted into Jupiter's thigh, and being born twice; becaufe in this mountain he and his army are faid to have been preferved, when difeafe and peftilence raged in the plains below.

MESARAIC-vessels, in the general fenfe, are the fame with Mesenteric.

In common ufe, mefaraic is more frequently applied to the veins, and mefenteric to the arteries, of the mefentery. See Anatomy.

MESCHED, a confiderable town of Perfia, and in the province of Khoraffan; fortified with feveral towers, and famous for the magnificent fepulchre of Iman Rifa, of the family of Ali, to whom the Perfians pay great devotion. It is feated on a mountain near this town, in which are fine torquife-ftones; in E. Long. 59. 25. N. Lat. 37. c.

MESEMBRYANTHEMUM, Fig-marigold, in botany: A genus of the pentagynia order, belonging to the icofandria clafs of plants; and in the natural method ranking under the 13th order, *Succulentæ.* The calyx is quinquefid; the petals are numerous and linear; the capfule is flefhy, inferior, and monofpermous. There are between 40 and 50 fpecies; all African plants, from the Cape of Good Hope; near 40 of which are retained in our gardens for variety. Of thefe only one is annual, and the moft remarkable of them all. It is called the *cryftallinum, diamond ficoides,* or *ice-plant.* It rifes with a fhort, thick, fucculent ftalk, dividing low into many trailing, very fpreading, fucculent branches, befpangled all over with icy pimples; very pellucid and glittering; oval, undulate, alternate, papulofe or pimply, glittering leaves; and from the fides of the branches, numerous, almoft clofe fitting, white flowers, tinged with red or crimfon; fucceeded by plenty of feed in autumn This fingular and curious plant, being clofely covered with large pellucid pimples, full of moifture fhining brilliantly like diamonds, is in great efteem. It is a very tender plant while young; and is raifed annually from feed by means of hot-beds. In June it will endure the open air till October, when it perifhes; but if placed in a hot-houfe in autumn, it will often live all winter. It is commonly planted in pots for the conveniency of removing from place to place; but if planted in the full ground, it grows confiderably ftronger, even to luxuriance: however, when confined in pots, it flowers more abundantly.

The other fpecies are moft durable in ftem and foliage. Some are fhrubby; others pendulous, with loofe ftraggling ftems, and branches inclining to the ground; while others have no ftalks at all: their leaves are univerfally very thick, fucculent, flefhy; and of many various fhapes, fituations, and directions; while fome are curioufly punctured, or dotted with tranfparent points, and fome have pellucid pimples, as already mentioned: they afford a very agreeable variety at all times in the year, and merit a place in every collection. They are green-houfe plants, and are propagated by cuttings of their ftalks and branches.

MESENTERIC, or Mesaraic, an epithet given to two arteries arifing from the defcending aorta, and proceeding to the mefentery. See Mesentery.

MESENTERITIS, or *Inflammation of the* Mesentery. See Medicine, n° 191.

MESENTERY, Mesenterium, (formed of μεσο- *middle,*

middle, and *εντερον inteftine*), in anatomy, a fatty membranous body, thus called as being placed in the middle of the inteftines, which it connects to one another. See ANATOMY, n 94.

MESHES *of* NETS, the openings or interftices between the threads.

MESN, or MESNE, a term in law, fignifying him who is lord of a manor, and fo hath tenants holding of him; yet he himfelf holds of a fuperior lord.

The word is properly derived from *maifne, quafi minor natu*; becaufe his tenure is derived from another, from whom he holds.

MESN alfo denotes a writ, which lieth where there is lord mefn and tenant; and the tenant is diftrained for fervices due from the mefn to the fuperior lord.

This is in the nature of a writ of right; and in this cafe the tenant fhall have judgment to be acquitted or indemnified by the mefne lord; and if he makes default therein, or does not appear originally to the tenant s writ, he fhall be forejudged of his mefnalty, and the tenant fhall hold immediately of the lord paramount himfelf.

MESOCHRI, were muficians among the ancients who prefided in concerts, and by beating a wooden defk regularly with their feet, directed the meafure of the mufic. For the purpofe of beating time, they wore wooden clogs, called by the ancients *crupezia*, which occafioned the found to be better heard.

MESOCOLON, in anatomy, that part of the mefentery, which, having reached the extremity of the ileum, contracts and changes its name. See ANATOMY, n° 94.

MESOLOGARITHMS, according to Kepler, are the logarithms of the co-fines and co-tangents; the former of which were called by Baron Napier *anti-logarithms*, and the latter *differentials*.

MESOPOTAMIA, the ancient name of the province of DIARBECK, in Turky in Afia. It is fituated between the rivers Euphrates and Tigris; having Affyria on the eaft, Armenia on the north, Syria on the weft, and Arabia Deferta with Babylonia on the fouth. The Hebrews called it *Padan-aram* (Gen. xxviii. 2. &c.), and *Aram Naharaim* (title of Pfal. lx.) or Aram *of the two rivers*, becaufe it was firft peopled by Aram father of the Syrians, and is fituated between the two rivers already mentioned. This country is much celebrated in fcripture, as being the firft dwelling of men both before and after the deluge; and becaufe it gave birth to Phaleg, Heber, Terah, Abraham, Nahor, Sarah, Rebekah, Rachel, Leah, and to the fons of Jacob. Babylon was in the ancient Mefopotamia, till, by vaft labour and induftry, the two rivers of the Tigris and Euphrates were united into one channel. The plains of Shinar were in the fame country. Often they gave it the name of Mefopotamia (Deut. xxiii 4. &c.) and fometimes that of Syria, (Hofea xii. 12.) Balaam fon of Beor was of Mefopotamia, Deut. xxiii. 4. Chufhan-rifhathaim king of Mefopotamia kept the Hebrews in fubjection fome time after the death of Jofhua, Judg. iii. 8.

MESOPTERYGIUS, in ichthyology, a term applied to fuch fifhes as have only one back-fin, and that fituated in the middle of the back.

MESPILUS, the MEDLAR, in botany: A genus of the pentagynia order, belonging to the icofandria clafs of plants; and in the natural method ranking under the 36th order, *Pomaceæ*. The calyx is quinquefid; the petals are five; the berry is inferior and pentafpermous. There are feven fpecies, viz.

1. The Germanica, German mefpilus, or common medlar, rifes with a deformed tree-ftem, branching irregularly 15 or 20 feet high; fpear-fhaped leaves, downy underneath; and large clofe fitting, white flowers, fingly from the fides of the branches; fucceeded by large roundifh brown fruit, the fize of middling apples, which ripen in October, but are not eatable till beginning to decay. The varieties are, common great German medlar—fmaller Nottingham medlar—fpear-fhaped Italian medlar. This fpecies and varieties are all cultivated in the Englifh gardens for the fruit: but the German or Dutch medlar, and the Nottingham kind, are the moft comm n; and the latter of which two, though a fmaller fruit, is rather preferable for richnefs and poignancy of flavour. Thefe kinds of fruit are never eatable until they begin to rot; for when firm and found, they are of a fingularly auftere difagreeable tafte; yet having lain fome time after being gathered, till they begin to affume a ftate of decay and become foft, they acquire a delicious flavour, extremely agreeable to many, though to others altogether unpalatable.—All thefe forts ripen in the latter end of October, or beginning of November; when being gathered, fome fhould be laid in moift bran, in feveral layers, to forward their decay; others on ftraw in the fruitery: thofe in the bran will begin to be ready for ufe in about a fortnight, and thofe laid on ftraw will come gradually forward in fucceffion.

2. The arbutifolia, arbutus-leaved mefpilus, hath a fhrubby ftem, branching erectly five or fix feet high; lanceolate, crenated, alternate leaves, downy underneath; and from the fides and ends of the branches, fmall white flowers in clufters; fucceeded by fmall, roundifh, purple fruit, like haws.

3. The amelanchier, or fhrubby medlar, with black fruit, rifes with feveral fhrubby, flender, hairy ftems, branching moderately about four feet high, having purplifh branches; oval, ferrated leaves, downy underneath; and fmall white flowers, in clufters at the ends of the branches: fucceeded by fmall black fruit.

4. The chamæ-mefpilus, or dwarf medlar, commonly called *baftard quince*, hath a fhrubby, flender, fmooth ftem, branching weakly four or five feet high, having purplifh branches; oval, ferrated, fmooth leaves, on long foot-ftalks; and from the axillas, purple flowers, collected into round heads, with narrow, purplifh, deciduous bracteæ; fucceeded by fmall red fruit.

5. The cotoneafter, commonly called *dwarf quince*, rifes with a fhrubby, fmooth ftem, branching four or five feet high, the branches flender and reddifh; oval entire leaves on fhort foot-ftalks; and from the axillas, fmall clofe-fitting purple flowers, two or three together; fucceeded by fmall roundifh, bright-red fruit.

6. The Canadenfis, Canada fnowy mefpilus, hath a fhrubby, fmooth ftem, branching four or five feet high, with fmooth, purplifh branches; oval-oblong, ferrated, fmooth leaves, on long footftalks; and all the

the branches terminated by clusters of snowy-white flowers; succeeded by small, purplish fruit, like haws.

7. The pyracantha, or ever-green thorn, rises with a shrubby, spinous stem, branching diffusely 12 or 14 feet high, the branches slender and flexible, with a dark greenish bark, armed with long sharp spines; spear-shaped-oval, crenated, ever-green leaves; and all the shoots terminated by numerous clusters of whitish flowers; succeeded by large bunches of beautiful red berries, remaining all winter, and exhibiting a very ornamental appearance.

All these seven species of mespilus are of the tree and shrub kind; the first six sorts are deciduous, the seventh an ever-green; the leaves are universally simple; those of the mespilus Germanica very large, the others mostly of moderate size, and which in most of the sorts grow upon short footstalks. They all flower abundantly every summer, the flowers universally hermaphrodite, and consisting each of five large roundish petals, 20 stamina, and five styles. They are all very hardy, and succeed in any common soil and situation, and their propagation and culture is very easy.

The first sort and varieties are cultivated as fruit-trees, principally as standards, sometimes also as espaliers for variety. The other species are very proper furniture for any ornamental plantation, where they will make an agreeable variety with their different foliage; and their flowers make a fine appearance, as also their fruit in autumn and winter, which, if not devoured by birds, remain long on the branches, and afford a fine variety in those seasons. The pyracantha, being rather of flexible growth, is most commonly trained against walls or the fronts of houses, both for the support of its flexible branches, and that it may exhibit its berries more ornamentally.

When it is designed to have any of the common medlars as fruit-trees, they may be trained either as dwarfs, for dwarf standards, or for espaliers, or trained as half or full standards, and managed in either of those modes of training nearly as other fruit-trees, particularly the apple and pear; and are raised either by seed, by grafting, or by budding; but either of the two latter methods are the most certain for continuing the sorts without variation: observing, after shortening their first shoots from the graft or bud, where it shall seem necessary to force out a proper supply of wood to form a head, to train the branches afterwards principally at full length, and let the standards branch out in their own way.

MESS, in a military sense, implies a number of soldiers, who, by laying away a certain proportion of their pay towards provisions, mess together: six or eight is generally the number of each mess. Experience proves, that nothing contributes more to the health of a soldier, than a regular and well chosen diet, and his being obliged every day to boil the pot: it corrects drunkenness, and in a great measure prevents gaming, and thereby desertion.

MESSALINA (Valeria), a daughter of Messala Barbatus. She married the emperor Claudius, and disgraced herself by her cruelties and incontinence. Her husband's palace was not the only seat of her lasciviousness, but she prostituted herself in the public streets, and few men there were at Rome who could not boast of having enjoyed the favours of the impure Messalina. Her extravagancies at last irritated her husband, who commanded her to appear and answer all the accusations which were brought against her: upon which she attempted to destroy herself; and when her courage failed, one of the tribunes who had been sent to her dispatched her with his sword. It is in speaking of her debaucheries and lewdness that Juvenal says,

Et lassata viris, necdum satiata, recessit.

Her name has become a common appellation to denote a woman of shameless and inordinate lust.

MESSANA, (anc. geog.), the first town of Sicily on crossing over from Italy, situated on the strait now called the *Faro*, (Italicus). Anciently called *Zancle*, according to Diodorus Siculus, from king Zanclus; or, according to others, from the Sicilian term *Zanclon*, denoting a sickle, alluding to the curvity of the coast: a name appropriated by the poets; and hence *Zanclæi*, the people, (Herodotus, Pausanias). The other name *Messana* is from the *Messenii* of Peloponnesus, (Strabo). Thucydides ascribes its origin to Anaxilas the Messenian, tyrant of Rhegium, who received all comers, calling the town after the name of his country. The Greeks always call it *Messene*; the Romans *Messena* constantly, to distinguish it from *Messene* of Peloponnesus. Now MESSINA, lately ruined by earthquakes.

MESSENA, or MESSENE, an inland town, and the capital of Messenia, a country of Peloponnesus; erroneously placed by Ptolemy on the coast. It was built by Epaminondas, who recalled all the Messenian exiles, and gave the town the name of *Messene*. A place vying in point of strength and situation with Corinth, according to Strabo; and therefore Demetrius Phalerius advised Philip, father of Perseus, that if he wanted to have Peloponnesus in his power, he should make himself master of these two towns, as thus he would have the ox by both horns.

MESSENGERS, are certain officers chiefly employed under the direction of the secretaries of state, and always in readiness to be sent with all kinds of dispatches foreign and domestic. They also, by virtue of the secretaries warrants, take up persons for high treason, or other offences against the state. The prisoners they apprehend are usually kept at their own houses, for each of which they are allowed 6s. 8d. *per* day by the government: and when they are sent abroad, they have a stated allowance for their journey, viz. 30l. for going to Paris, Edinburgh, or Dublin; 25l. for going to Holland; and to other places in the same proportion; part of which money is advanced for the expence of their journey. Their standing salary is 45l *per annum*; and their posts, if purchased, are esteemed worth 300l. The messengers wait 20 at a time, monthly, and are distributed as follows, viz. four at court, five at one secretary's office, five at another, two at the third for North Britain, three at the council-office, and one at the lord chamberlain's of the household.

MESSENGERS, in Scotland. See LAW, Part III. p. 651, par. 16.

MESSENGERS of the Exchequer, are four officers who attend the exchequer, in the nature of pursuivants, and carry the lord treasurer's letters, precepts, &c.

MESSENGER of the Press, a person who, by order of

Messenia. of the court, searches printing-houses, booksellers shops, &c. in order to discover the printers or publishers of seditious books, pamphlets, &c.

MESSENIA, a country in the south of Peloponnesus, mostly maritime, situated between Elea to the west, and Laconica to the east. Anciently a part of Laconica under Menelaus, and called *Messene* by Homer; interpreted by the scholiast, *Messenæa Regio*. *Messenii*, the people, reduced to a state of slavery and subjection by the Spartans; *Messenius*, the epithet.

This country is famous in history, on account of the resistance made by the Messenians against the Spartans, and the exploits of their hero Aristomenes. The first hostilities commenced about the year 652 B. C. on what occasion is uncertain. Though the Messenians were inferior in the knowledge of the art of war to the Spartans; yet, by keeping for some time on the defensive, they improved so much, that in three years time they found themselves in a capacity of giving battle to their enemies in the open field; nor did they appear to be in any degree inferior either in courage or conduct: the war was therefore protracted, with various success, on both sides. At last, both consulted the oracle at Delphi; and received for answer, "that whoever should first dedicate 100 tripods in the temple of Jupiter at Ithome, a strong-hold of the Messenians, should be masters of the country." The inhabitants of Messenia, on hearing this, having no money to make the tripods of brass, fell to cutting them out in wood; but before this could be accomplished, a Spartan having got into the city by stratagem, dedicated 100 little tripods of clay: which threw the Messenians into such despair, that they at last submitted to the Spartans.

The new subjects of Sparta were treated with the utmost barbarity by these cruel tyrants; so that a new war commenced under Aristomenes, a man of unconquerable valour, and enthusiastically fond of liberty. He perceived that the Argives and Arcadians, who were called the *allies* of the Lacedæmonians, adhered to them only through fear of their power; but that in reality they hated them, and wished to revenge the injuries they had done them. To these Aristomenes applied; and receiving an answer conformable to his wishes, he engaged his countrymen unanimously to take up arms. About a year after the revolt began, and before either party had received any auxiliaries, the Spartans and Messenians met at a village called *Deræ*, where an obstinate engagement ensued. Aristomenes was conceived to have performed more than mortal atchievements: in gratitude therefore, respect being also had to his royal descent, his countrymen unanimously saluted him *king*: which title he modestly waved, alleging, that he took up arms to set them free, and not to make himself great: he consented, however, to accept the title of *general*, with a power of doing whatsoever he thought requisite for the service of the public. Knowing well the superstition of the age in which he lived, he resolved to intimidate the Spartans, by showing them what he was sure they would take for an ill omen. Disguising himself therefore, he went privately to the city, where, in the night, he hung up a shield on the wall of the temple of Minerva, with this inscription: *Aristomenes dedicates this, out of the spoils of the Spartans, to the goddess.* It was easily perceived that this war would be both long and bloody; the Lacedæmonians therefore sent deputies to Delphi, to inquire of the oracle concerning its event: the answer they received was, *That it behoved the Spartans to seek a leader from Athens.* The Athenians, naturally envious of the Spartans, granted their request indeed, but in such a manner as manifested their spite; for they sent them for a general Tyrtæus, a schoolmaster and poet, lame of one foot, and who was suspected to be a little out of his wits. But here their skill failed them; for this captain, notwithstanding his despicable appearance, proved of great consequence to Sparta, teaching them how to use good, and how to bear up under evil fortune.

In the mean time, Aristomenes had drawn together a mighty army, the Eleans, Argives, Sicyonians, and Arcadians, having sent troops to his assistance; the Spartans in this, as in the former war, having no ally but Corinth. The Spartan kings, according to the custom of their city, no sooner took the field, than, notwithstanding their inferiority in number, they offered the enemy battle, which Aristomenes readily accepted.—It was long, obstinate, and bloody; but in the end the Messenians were victorious, and the Lacedæmonians put to flight with a great slaughter. It is scarce to be conceived how much the Spartans were struck with this defeat: they grew weary of the war, dissatisfied with their kings, diffident of their own power, and in a word sunk into a state of general uneasiness and want of spirit. It was now that the Athenian general convinced them, that he was capable of fulfilling all the promises of the oracle; he encouraged them by his poems, directed them by his counsels, and recruited their broken armies with chosen men from among the Helotes. Aristomenes, on the other hand, acted with no less prudence and vigour. He thought it not enough to restore the reputation of the Messenians, if he did not also restore their wealth and power: he therefore taught them to act offensively against their enemies; and, entering the territories of Sparta, he took and plundered Pharæ, a considerable borough in Laconia, putting all such as made any resistance to the sword, carrying off at the same time an immense booty. This, however, was an injury which the Spartans could not brook with patience; they therefore sent immediately a body of forces to overtake the Messenians, which accordingly they did: but Aristomenes routed these pursuers, and continued to make a mighty slaughter of them, till such time as he was disabled by having a spear thrust in his side, which occasioned his being carried out of the battle. His cure, which took up some time, being finished, he resolved to carry the war even to the gates of Sparta; and to that purpose raised a very great army: but, whether he found his design impracticable, or was really diverted by some dream, he gave out, that Castor and Pollux, with their sister Helena, had appeared to him, and commanded him to desist. A short time after this retreat, going with a small party to make an incursion, and attempting to take prisoners some women who were celebrating religious rites near Egila, a village in Laconia, those zealous matrons fell upon him and his soldiers with such fury, that they put them to flight, and took him prisoner:

Meſſenia. priſoner: however, he ſoon afterwards made his eſcape, and rejoined his forces. In the third year of the war, the Spartans with a great force entered Meſſenia, whither Ariſtocrates king of Arcadia was come, with a great body of troops, to the aſſiſtance of his allies: Ariſtomenes therefore made no difficulty of fighting when the Spartans approached; but they entering privately into a negociation with Ariſtocrates, engaged him with bribes and promiſes to betray his confederates. When the battle began, the deceitful Arcadian repreſented to the forces under his command the mighty danger they were in, and the great difficulty there would be of retreating into their own country, in caſe the battle ſhould be loſt: he then pretended, that the ſacrifices were ominous; and, having terrified his Arcadians into the diſpoſition of mind fitteſt to ſerve his purpoſe, he not only drew them off from both wings, but, in his flight, forced through the Meſſenian ranks, and put them too in confuſion. Ariſtomenes and his troops, however, drew themſelves into cloſe order, that they might defend themſelves the beſt they could: and indeed they had need of all their valour and ſkill; for the Lacedæmonians, who expected this event, immediately attacked and ſurrounded them on all ſides. Fortune was, on this occaſion, too powerful either for the courage or the conduct of the Meſſenians; ſo that, notwithſtanding their utmoſt efforts, moſt of their army were cut to pieces, and amongſt them the chief of their nobility. Ariſtomenes, with the poor remains of his ſhattered forces, retired as well as he could; and, perceiving that it was now impoſſible to maintain the war againſt the Lacedæmonians upon equal terms, he exhorted his countrymen to fortify mount Era, and to make the beſt diſpoſitions poſſible for a long defence. He likewiſe placed garriſons in Pylus and Methone on the ſea-coaſts; and to theſe three places he gathered all the inhabitants, leaving the reſt of Meſſenia to the mercy of the Spartans. They, on the other hand, looked on the war as now in a manner finiſhed; for which reaſon they divided the lands among their citizens, and cauſed them to be carefully cultivated, while they beſieged Era. But Ariſtomenes quickly convinced them that the war was far from being over: he choſe out of all the Meſſenians 300 men, with whom he ravaged all the adjacent country; carried off a prodigious booty; and, when Meſſenia could no longer ſupply the wants of his garriſon, penetrated into Laconia, and bore away corn, wine, cattle, and whatever elſe was neceſſary to the ſubſiſtence of his countrymen ſhut up in Era: ſo that at laſt the Spartans were conſtrained to iſſue a proclamation, forbidding the cultivation, not only of the Meſſenian territory in their hands, but alſo of Laconia in its vicinity; whereby they diſtreſſed themſelves more than their enemies, inducing at laſt a famine in Sparta itſelf, which brought with it its uſual attendant, ſedition. Here again all things had gone wrong, if the wiſdom of the poet Tyrtæus had not ſupported the Spartan courage; nor was it without much difficulty that he influenced them to continue the blockade of Era, and to maintain a flying camp for the ſecurity of the country.

Ariſtomenes, in ſpite of all theſe precautions, committed terrible depredations with his ſmall corps of 300 men. Amongſt other places which he plundered, the city of Amyclæ was one; from whence he carried not only a great quantity of riches, but alſo many carriages laden with proviſions. The kings of Sparta lying with their troops in its neighbourhood, as ſoon as they heard of this expedition, marched after Ariſtomenes with the utmoſt diligence; and, as the Meſſenians were encumbered with their booty, came up with them before they could reach Era. In this ſituation of things, Ariſtomenes, prompted rather by deſpair than prudence, diſpoſed his troops in order of battle; and, notwithſtanding they were ſo few, made a long and vigorous reſiſtance againſt the whole Lacedæmonian army. At length, however, numbers prevailed: the greateſt part of the Meſſenians were ſlain on the ſpot; and Ariſtomenes, with about 50 of his men who ſurvived the ſlaughter, were taken priſoners; that chief having received ſo many wounds, that he was ſenſeleſs when they carried him away. The Lacedæmonians expreſſed the loudeſt joy at the ſight of this illuſtrious captive; who for ſo many years, by his ſingle abilities, had enabled his exhauſted country to defend itſelf againſt the the whole force of Sparta. When he was recovered of his wounds, they decreed him and all his fellow-priſoners to be thrown together into a deep cavern, which was the common puniſhment of the loweſt kind of offenders. This judgment was executed with the utmoſt ſeverity, excepting that Ariſtomenes had leave to put on his armour. Three days he continued in this diſmal place, lying upon and covered over with dead bodies. The third day, he was almoſt famiſhed through want of food, and almoſt poiſoned with the ſtench of corrupted carcaſes, when he heard a fox gnawing a body near him. Upon this he uncovered his face, and perceiving the fox juſt by him, he with one hand ſeized one of its hind-legs, and with the other defended his face, by catching hold of its jaw when it attempted to bite him. Following as well as he could his ſtraggling guide, the fox at laſt thruſt his head into a little hole; and Ariſtomenes then letting go his leg, he ſoon forced his way through, and opened a paſſage to the welcome rays of light, from which the noble Meſſenian had been ſo long debarred. Feeble as he was, Ariſtomenes wrought himſelf an outlet with his nails; and travelling by night with all the expedition he could, at length arrived ſafe at Era, to the great joy and amazement of his countrymen. When this news was firſt blazed abroad, the Spartans would have had it paſs for a fiction; but Ariſtomenes ſoon put the truth of it out of doubt, by falling on the poſts of the Corinthians, who, as allies of the Spartans, had a conſiderable body of troops before Era. Moſt of their officers, with a multitude of private men, he ſlew; pillaged their camp; and, in ſhort, did ſo much miſchief, that the Spartans, under the pretence of an approaching feſtival, agreed to a ceſſation of arms for 40 days, that they might have time to bury their dead. On this occaſion, Ariſtomenes for the ſecond time celebrated the *hecatomphonia*, or the ſacrifice appointed for thoſe who had killed 100 of the enemy with their own hands. He had performed the ſame before and after his ſecond battle; and he lived to do it a third time: which muſt appear wonderful to the reader, when he is informed, that, notwithſtanding this truce, certain Cretan archers in the ſervice of the Spar-

Messenia. tans seized Aristomenes as he was walking without the walls, and carried him away a prisoner. There were nine of them in all; two of them immediately flew with the news to Sparta, and seven remained to guard their prize, whom they bound, and conducted to a lone cottage inhabited only by a widow and her daughter. It so fell out, that the young woman dreamt the night before, that she saw a lion without claws, bound, and dragged along by wolves; and that she having loosed his bonds, and given him claws, he immediately tore the wolves to pieces. As soon as Aristomenes came into the cottage, and her mother, who knew him, had told her who he was, she instantly concluded that her dream was fulfilled; and therefore plied the Cretans with drink, and, when they were asleep, took a poinard from one of them, cut the thongs with which Aristomenes was bound, and then put it into his hands. He presently verified her vision, by putting all his guards to death; and then carried her and her mother to Era, where, as a reward for her service, he married the young woman to his son Gorgus, then about 18 years of age.

When Era had held out near eleven years, it fell into the hands of Sparta by an accident: the servant of one Empiramus, a Spartan commander, driving his master's cattle to drink at the river Neda, met frequently with the wife of a Messenian, whom he engaged in an amour. This woman gave him notice, that her husband's house was without the wall; so that he could come to it without danger, when the good man was abroad; and she likewise gave him intelligence when her husband was upon duty in the garrison. The Spartan failed not to come at the time appointed; but they had not been long in bed before the husband returned, which put the house into great confusion: the woman, however, secured her gallant; and then let in her husband, whom she received in appearance with great joy, inquiring again and again by what excess of good fortune she was blessed with his return. The innocent Messenian told her, that Aristomenes being detained in his bed by a wound, the soldiers knowing that he could not walk the rounds, had a grant to retire to their houses, to avoid the inclemency of the season. The Spartan no sooner heard this, than he crept softly out of doors, and hastened away to carry the news to his master. It so happened, that the kings were at this time absent from the camp, and Empiramus had the chief command of the army. As soon as he received this information, he ordered his army to begin its march, though it rained excessively, and there was no moon-light. The fellow guided them to the ford, and managed matters so well that they seized all the Messenian posts: yet, after all, they were afraid to engage; darkness, an high wind, heavy rain, together with the dread of Aristomenes, keeping them quiet in the places they had seized. As soon as it was light, the attack began; and Era had been quickly taken, if only the men had defended it; but the women fought with such fury, and by their mingling in the fray, brought such an accession of numbers, as made the event doubtful. Three days and two nights this desperate engagement lasted: at last, all hopes of preserving the city being lost, Aristomenes drew off his wearied troops. Early the fourth morning, he disposed the women and children in the centre, the Messenian youth in the front and rear, the less able men in the main body: himself commanded the van; the rear-guard was brought up by Gorgus and Manticlus, the former the son of Aristomenes, the latter of Theocles, a Messenian of great merit, who fell with much glory in this attack, fighting valiantly in the cause of his country. When all things were ready, Aristomenes caused the last barrier to be thrown open; and, brandishing his spear, marched directly towards the Spartan troops, in order to force a passage. Empiramus, perceiving his intent, ordered his men to open to the right and left, and fairly gave them a passage; so that Aristomenes marched off in triumph, as it were, to Arcadia. Messenia.

The Arcadians, when they heard that Era was taken, were very desirous of succouring their old confederates in this deep distress: they therefore intreated their king Aristocrates to lead them into Messenia. But he, corrupted by the Lacedæmonians, persuaded them that it was too late; that the Messenians were all cut off; and that such a step would only expose them to the fury of the conquerors. When the thing appeared to be otherwise, and it was known that Aristomenes was on the frontiers of Arcadia, they went in crowds to carry him provisions, and to testify their readiness to afford him and those under his command all the assistance in their power. Aristomenes desired to be heard before a general assembly; which being accordingly convoked, he there opened one of the boldest and best-laid schemes recorded in history: he said, that he had yet 500 undaunted soldiers, who, at his command, would undertake any thing; that it was very probable most of the Spartans were employed in pillaging Era, and that therefore he determined to march and surprise Sparta; which appeared so sensible, that all the assembly loudly commended his great capacity and unshaken courage. Aristocrates, however, took care to betray him; having, by various pretences, retarded the execution of the project. The Arcadians, who began to suspect him, waited for and surprised the messengers as they came back. They took the letters from him, and read them openly in the assembly. The purport of them was, that they acknowledged his great kindness both now and in the battle; and promised, that the Lacedæmonians would be grateful. As soon as the letters were read, the Arcadians fell to stoning their king, frequently calling upon the Messenians to assist them; which, however, they did not, waiting for Aristomenes's orders; who, far from triumphing in this spectacle, stood still, with his eyes fixed on the ground, which he wet with his tears, his soul pierced with sorrow to see a crowned head so shamefully and so deservedly put to death. The Arcadians afterwards erected a monument over him, with an inscription to perpetuate his infamy. As for the Messenians under the command of Gorgus and Manticlus, they passed over into Sicily; where they founded the city of Messene, one of the most famous in the island. Aristomenes remained, however, in Greece; where he married all his daughters, except the youngest, to persons of great rank. A prince of Rhodes, inquiring of the oracle at Delphi whom he should espouse, that his subjects might be happy under his posterity, was directed

Meſſiah.

directed to marry the daughter of the moſt worthy of the Greeks; which anſwer was immediately underſtood to point at the virgin daughter of Ariſtomenes. Her therefore he demanded, and received; Ariſtomenes accompanying him back to his dominions, where he formed a ſcheme of uniting the Lydians and Medes againſt the Spartans, reſolving with this view to go into Media, and to the court of Sardis; but while he meditated theſe great things, death ſurpriſed him, and thereby freed Lacedæmon from the moſt formidable enemy ſhe ever had.

MESSIAH, a word ſignifying one *anointed*, or inſtalled into an office by unction. It was uſual among the Jews to anoint kings, high-prieſts, and ſometimes prophets, at the deſignation or inſtallment of them, to ſignify emblematically the mental qualifications neceſſary for diſcharging theſe offices. Saul, David, Solomon, and Joaſh, kings of Judah, received the royal unction. Aaron and his ſons received the ſacerdotal, and Eliſha the diſciple of Elijah received the prophetic unction.—The name MESSIAH, *Anointed*, or *Chriſt* (Χριστος), was given to the kings and high-prieſts of the Jews. The patriarchs and prophets are alſo called by the name of *Meſſiahs*, or the *Lord's anointed*. See 1 Sam. xii. 3, 5. 1 Chron. xvi. 22. Pſ. cv. 15.

But this name MESSIAH was principally and by way of eminence given by the Jews to their expected great Deliverer, whoſe coming they ſtill vainly wait; and is a name the Chriſtians apply to *Jesus Chriſt*, in whom the prophecies relating to the Meſſiah were accompliſhed. The ſum of theſe prophecies is, That there ſhould be a glorious perſon named *Meſſiah*, deſcended from Abraham, Iſaac, and Jacob, who ſhould be born at Bethlehem, of a virgin of the family of David, then in its decline, before the Jews ceaſed to be a people, while the ſecond temple was ſtanding, and about 500 years after Ezra's time; who, though appearing in mean circumſtances, ſhould be introduced by a remarkable forerunner, whoſe buſineſs it ſhould be to awaken the attention and expectation of the people. That this illuſtrious perſon called *Meſſiah* ſhould himſelf be eminent for the piety, wiſdom, and benevolence of his character, and the miraculous works he ſhould perform: yet that, notwithſtanding all this, he ſhould be rejected and put to death by the Jews; but ſhould afterwards be raiſed from the dead, and exalted to a glorious throne, on which he ſhould through all generations continue to rule, at the ſame time making interceſſion for ſinners. That great calamities ſhould for the preſent be brought on the Jews for rejecting him: whereas the kingdom of God ſhould by his means be erected among the Gentiles, and diſperſe itſelf even unto the ends of the earth; wherever it came, deſtroying idolatry, and eſtabliſhing true religion and righteouſneſs. In a word, That this glorious perſon ſhould be regarded by all who believed in him as a divine teacher, an atoning ſacrifice, and a royal governor: by means of whom God would make a covenant with his people, very different from that made with Iſrael of old; in conſequence of which they ſhould be reſtored to, and eſtabliſhed in, the divine favour, and fixed in a ſtate of perpetual happineſs. See *Jesus Chriſt*, and CHRISTIANITY.

The Jews, as was already obſerved, ſtill wait for the coming of the *Meſſiah*, being infatuated with the notion of a temporal *Meſſiah*, who is to be a mighty conqueror, and to ſubdue all the world. Moſt of the modern rabbins, according to Buxtorf, believe that the *Meſſiah* is already come, but that he keeps himſelf concealed, and will not manifeſt himſelf becauſe of the ſins of the Jews. Some of the Jews, however, in order to reconcile thoſe prophecies that ſeem to contradict each other as to the character and condition of the *Meſſiah*, have had recourſe to the hypotheſis of two *Meſſiahs*, who are yet to ſucceed each other; one in a ſtate of humiliation and ſuffering; the other of glory, ſplendor, and power. The firſt, they ſay, is to proceed from the tribe of Ephraim, who is to fight againſt Gog, and to be ſlain by Annillus, Zech. xii. 10. The ſecond is to be of the tribe of Judah, and lineage of David, who is to conquer and kill Annillus, and reſtore the kingdom of Iſrael, reigning over it in the higheſt glory and felicity.

Jeſus Chriſt aſſerts himſelf the *Meſſiah*. In St John iv. 25. the Samaritan woman ſays to Jeſus, *I know that when* Meſſiah *comes, who is called the* Chriſt; *he will tell us all things. Jeſus anſwered her, I that ſpeak to thee am he.*

There are ſeveral impoſtors, who have endeavoured to paſs for *Meſſiahs*, as Chriſt himſelf predicted. J. Lent, a Dutchman, has written a hiſtory *De Pſeudo-meſſiis*, "Of Falſe Meſſiahs." The firſt he mentions was one Barcochab, who appeared under the empire of Adrian. The laſt was rabbi Mordecai, who began to be talked of in 1652. A little before him, viz. in 1666, appeared Sabbethai Sebi, who was taken by the Turks, and turned Mahometan.

Meſſiah, Meſſina.

MESSINA, an ancient, large, handſome, and ſtrong city of Sicily, and in the Val-di-Demona, with a citadel, ſeveral forts, a fine ſpacious harbour, and an archbiſhop's ſee. It is ſeated on the ſea-ſide, 110 miles eaſt of Palermo, 260 ſouth by eaſt of Rome, and 180 ſouth-eaſt of Naples. E. Long. 15. 50. N. Lat. 38. 10. The public buildings and the monaſteries were numerous and magnificent, and it contained about 60,000 inhabitants; the harbour is one of the ſafeſt in the Mediterranean, and extremely deep; the viceroy of Sicily reſides here ſix months in the year; and it was a place of great trade in ſilk, oil, fruit, corn, and excellent wine, eſpecially ſince it was declared a free port. This city in the beginning of the year 1783 ſuffered moſt dreadfully by the earthquakes, which ſhook great part of Calabria and Sicily to their foundations, overturned many rich and populous towns, and buried thouſands in their ruins: (ſee CALABRIA and EARTHQUAKE.)—The following account of Meſſina, as it ſtood before the above period, is extracted from Mr *Swinburne's Travels in Sicily*

A large chain of mountains preſſes upon the ſhore, and part of the city ſtands upon elevated ground. The mountains are many of them nobly wooded; the hills before them finely chequered with groves and fields. As the town runs in a ſweep along the edge of a declivity, every building of conſequence is ſeen to advantage, while the leſs noble parts are hidden by the Palazzata. This is a regular ornamental range of lofty houſes, with 19 gates, anſwering to as many ſtreets; it follows the ſemicircular bend of the port for one mile and five poles, and would have been the handſomeſt line of buildings in Europe had the deſign been com-

Messina. completed; but a considerable part of the extent is not finished, except merely in the front wall, and that seems to be in a very ruinous condition. Philibert Emmanuel of Savoy, viceroy of Sicily, in 1622 began this princely work. Before it is a broad quay, decorated with statues and fountains; ships of any burden can moor close to the parapet in great depth of water. At the west extremity is a small fort and a gate; the other end is closed by the governor's house and the citadel, a modern pentagonal fortress, built on the point where the isthmus or *braccio di San Ranicro* issues from the main land. On this slip of low ground, which with the Palazzato forms the circular harbour of Messina, are placed the light-house *(lazaretto)*, and on the point the old castle of St Salvatore. The circumference of the port is four miles: it probably owes its formation to an earthquake, which opened an immense chasm, and then filled it with water. Near the light-house is a kind of whirlpool in the sea, shown as the Charybdis of the ancients.

The inner part of Messina is dirty, though it contains a considerable number of neat churches and large substantial dwellings. The cathedral is Gothic, enriched with Saracenic mosaics on the altars and shrines; the front of the high altar is particularly splendid: Gagini has embellished the pulpit and some tombs with excellent specimens of his art.—In the treasury of this church is preserved the palladium of Messina, a letter from the Virgin Mary to its citizens (A). This is the title upon which the Messinese build their pretensions to pre-eminence over the whole island, nay over the whole world; to its virtues and patronage they attribute every piece of good fortune, and to their own unworthiness all sinister events that have befallen them. The authenticity of this epistle has been seriously impugned, and of course vigorously defended by many Sicilian divines and disputators.

There is another church in this city that deserves particular notice, not so much on account of its architecture or ornaments, as for its being the last refuge of the Greek liturgy, which was once the predominant service of the island, but gradually abolished by different conquerors. It is dedicated to the Virgin Mary de Grapheo, or of the *Letter*, which denomination may perhaps have furnished Lascaris with the idea of his letter. It is known at present by the name of *la Cattolica*. According to the Greek canons, the entrance of monastic churches was reciprocally forbidden to each sex, and the cathedrals were the only places of worship where a daily sacrifice was offered up by the bishop and clergy, and where both men and women were present at the same time, but in different parts of the church. From this general admittance the building acquired the title of *Catholic* or *universal*.

Messina is all paved with lava, cut into large flags of two feet square: a material which the vicinity of lavas render it easy to procure, and which being very hard resists friction better than any other

During a series of ages, notwithstanding the various revolutions and calamities to which it has been exposed, this city has still maintained its original situation; while most other cities have shifted their ground more or less from the place where they were first founded. But its situation enjoys advantages which have still tempted such of its inhabitants as escaped from the ravages of war and the desolation of earthquakes, to prefer it to every other spot, however delightful or secure. It is of very ancient origin; it has been under many different races of monarchs; and its name has been repeatedly changed: It has been at different times called *Zancle*, *Mamertina*, *Messana*. Its first name *Zancle*, which in the old language of Sicily meant "a sickle;" alluding, as some authors suppose, to the form of the port; or, according to others, to the

(A) The story is as follows: After St Paul had made some stay at Messina (a circumstance of his travels unnoticed by St Luke), the Messinese prevailed upon him to return to Jerusalem with an embassy of four persons sent by the city to the Virgin Mary. Their excellencies were graciously received by her, and brought back a letter written with her own hand in the Hebrew tongue, which St Paul translated into Greek. By the irruption of the Saracens this invaluable treasure was lost, and utterly forgotten till the year 1467, when Constantine Lascaris, a refugee Greek, found a copy of it, and turning it into Latin, made it known to the citizens, and then to all the Catholic world. Its authenticity is now so well established at Messina, that Regna the historian candidly acknowledges, that whoever was to confess even a doubt on the subject in that city would be treated as an infidel.

This curious epistle is conceived in these terms:—Maria Virgo Joachim filia, Dei humillima Christi Jesu crucifixi Mater, ex tribu Judæ stirpe David, Messanensibus omnibus salutem, et Dei patris omnipotentis benedictionem. Vos omnes fide magna legatos ac nuncios per publicum documentum ad nos misisse constat. Filium nostrum Dei genitum Deum et hominem esse fatemini, et in cœlum post suam resurrectionem ascendisse, Pauli apostoli electi prædicatione mediante viam veritatis agnoscentes. Ob quod vos et ipsam civitatem benedicimus cujus perpetuam protectricem nos esse volumus. Anno filii nostri XLII. Indict. I. III. Nonas Junii, luna XXVII. feria V. ex Hyerosolymis.

Thus translated:—"The Virgin Mary, daughter of Joachim, most humble mother of God, Jesus Christ crucified, of the tribe of Juda and the family of David, health and the blessing of God the Father Almighty to all the people of Messina. Out of the abundance of your faith, you have, in consequence of a public deliberation, sent a deputation to me; and since you acknowledge that my Son is both God and man, and that he ascended into heaven after his resurrection, as you have learned from the preaching of St Paul the apostle, I give my blessing to you and all your city, and agree to become your protectress. In the 42d year of my Son, the 1st of the Indiction, the 3d day of June, and the 27th of the moon, at Jerusalem."

Not to dwell upon the astronomical blunders in these dates, let it suffice to observe, that Lascaris was not aware that Denis the Little, a Syrian monk in the 6th century, was the first who made use of the era that commences at our Saviour's birth.

the fertility of the country. Allured by the advantages of its fituation, the Cumæans, a commercial and enterprifing people, invaded the ifland and drove the Siculi from this fettlement; they were in their turn overpowered by a band of Samian adventurers, who made way for a colony of citizens of Meffene, and under thefe mafters it changed its name to *Meffana*. Their government was of fhort duration; for in the 289th year before Chrift it was deftroyed by the Mamertines, a warlike unprincipled nation inhabiting the fouth part of Brutium. Thefe foldiers being received into Meffana on their return to Italy from Syracufe, where they had ferved as mercenaries in the army of Agathocles, took an opportunity of maffacring the inhabitants and ufurping their poffeffions. The city was now called *Mamertina:* and, in order to fupport themfelves againft the refentment of the Sicilian powers, the Mamertines implored the protection of the Romans, who, eager to extend their dominion beyond the limits of Italy, and jealous of the growing power of Carthage, made no fcruple to fuccour thefe affaffins with a confular army. This ftep brought on the firft Punic war. The Mamertines reaped no other fruit from the alliance but a more honourable degree of flavery; for fuch was the real nature of their connection with Rome, whatever name it might be difguifed under.

Meffina was, however, always diftinguifhed by particular attentions and favours from the fenate; and, excepting a fhort period during the wars of the triumvirate, appears to have tafted all the fweets of Roman profperity, without partaking of the bitter draughts of adverfity. Its fate, in the ruin of the empire, was fimilar to that of the reft of Sicily. In 829 Meffina fell into the hands of the Saracens, but obtained very honourable terms of capitulation; for half the city was left to the Chriftians, where they were to be governed by their own laws, and profefs their own religion undifturbed. In the other refided the bey of one of the five provinces into which the Arabian conquerors had divided the ifland. Notwithftanding this indulgence, Meffina was the firft to caft off the yoke in 1037, when George Maniaces landed an army of Greeks and Normans on the fhore of the Faro. It afterwards held out againft the whole Muffulman force, till the feeble ftate of a diftracted empire fhut out all hopes of affiftance from Conftantinople. This unfortunate city then opened its gates to the army of the caliph, and felt very feverely the weight of his refentment: but it did not long groan under the yoke; for in lefs than 20 years Roger the Norman took it by furprife and delivered it from Mahometan oppreffion. During the crufado our Richard Cœur de Lion and Philip Auguftus king of France wintered here in their way to Paleftine; a fojourn marked by continual quarrels, conflagration, and bloodfhed. The Meffinefe were particularly tardy in entering into the national confpiracy of 1282, but afterwards exceeded the reft of the infurgents in deeds of cruelty: This and the importance of their fituation fingled them out for the firft objects of Charles's vengeance He invefted their city very clofely, and declared fo openly his determination to refufe all terms whatever to the befieged, that they faw no hopes of fafety but in an obftinate defence. Their courage, perfeverance, and fufferings, were exceffive; at length their ftrength and refources began to fail rapidly, and every circumftance feemed to denounce their fpeedy deftruction, when Roger Lauria appeared off the harbour with the Arragonian fleet, forced the king to retire with precipitation acrofs the ftraits, and in his fight defeated and deftroyed his naval armament. Robert, grandfon of Charles I. alfo made a fruitlefs attack; but in the difturbed reign of Frederick III. Meffina was delivered up to Louis king of Naples and his confort queen Joan, who entered it in triumph. In a few years it returned to its former poffeffors. The year 1672 was remarkable for the revolt of the Meffinefe.—They threw off the Spanifh yoke, and fwore allegiance to Louis XIV. king of France. They were for fome time vigoroufly affifted by the French; but before the Spaniards had gained the leaft advantage to excite any hopes of recovering fo valuable a poffeffion, Louis found himfelf neceffitated from motives of political intereft to defert his new fubjects, and leave them to the mercy of their old incenfed mafters. The horror of being thus abandoned, and the chaftifement inflicted by Spain, broke the fierce fpirit of the Meffinefe; they were ftill ftunned with the remembrance and effects of this blow, when the plague in 1743 was introduced from the Levant and fwept away more than half the inhabitants. From this chain of calamities, the opulence, trade, and population of Meffina, have been gradually finking; and unlefs very favourable circumftances happen, will every year fall lower. The number of its inhabitants does not now exceed 30,000.

The following particulars are added from M. Houel, who vifited this city fince the late earthquakes, which completed its deftruction.

On the front of the cathedral there is a fquare, which, though not regular, is far from being mean. This was not the largeft fquare in Meffina before its overthrow; but it was the moft elegant, the moft fplendidly adorned, and the beft frequented. There ftands in this fquare an equeftrian ftatue of Charles II. of Spain, in bronze, which has been fpared by the earthquake. It ftands on a marble pedeftal, in the middle of the fquare. Oppofite to this ftatue is an elegant marble fountain, ornamented with a variety of figures, reprefenting men and other animals, all of them fpouting out water in great abundance; which ufed, in fummer, to fpread an agreeable and refrefhing coolnefs over the fquare, that induced company to affemble here. Seven ftreets terminated here. The cathedral forms a part of the fquare. It is dedicated to the bleffed Virgin; the occafion of which has been already mentioned.

There is an aniverfary feaft celebrated in Meffina, which is called *the feaft of the Letter*. A lock of the Virgin's hair, which fhe fent to the Meffenians at the fame time with the letter, is carried through the city in proceffion in a cryftal veffel. She made alfo a prefent of her picture to the Meffenian deputies. It is placed over the tabernacle. None but the canons of the cathedral are permitted to touch, or take up on their fhoulders, the filver fhrine in which the cryftal veffel with the Virgin's hair is depofited. Eight of thofe canons, with mitres on their heads, bear this fhrine in the proceffion. The canopy fufpended over it is fupported by fix fenators in their robes. The picture

Messina. picture and the hair are shown to strangers. This procession and the other religious ceremonies of this festival are followed by horse races. The spirits of the people being already elevated by their religious exercises, they engage with amazing eagerness in these and the other diversions with which they are accompanied; a tumultuous joy reigns over the city; and the evening concludes with illuminations and fire-works. The ships in the harbour pay the citizens the compliment of entertaining them with a discharge of their guns on the occasion.

Through a square called *the Square of the Great Hospital*, runs a large and impetuous torrent, the *Porto delle Legni*. It is precipitated from those lofty mountains which overlook this city on the south side. The channel which it has cut out for itself is at times entirely full. It would, on such occasions, overflow the square and other parts of the city, were it not confined by walls which have been built on both sides to prevent such accidents.—Another stream of a similar origin, called the *Torrent of La Boccetta*, runs through another part of the city; it is also confined within the walls to prevent it from overflowing.

The *Square of St John of Malta* is one of the largest in Messina. In the middle of this square is a fine marble fountain, ornamented with a variety of sculptured figures and jets d'eau. Beside the fountain there used to stand a large reservoir for horses to drink out of.

In the time of the annual festivals, there used to be exhibited on the waters of the reservoir a galley, or rather a fictitious representation of a galley, with galley-slaves, soldiers, officers, and a commander on board, all in arms, and the galley properly equipped as a ship of war. This galley was decorated with great art; and by night the masts, and every other suitable part, were hung with lamps, which illumined it in a very splendid manner. Every thing around was so artificially disposed, that when the fire-works were played off, the spectator was led to think, though he perceived only one galley, that the noise which he heard was produced by a naval combat; and that the other ships were concealed from his view by the smoke occasioned by the guns and fire-works. This, when properly conducted, was a noble spectacle. The senate repaired thither from the cathedral, attended with a guard and a numerous company. In one carriage sat six senators, the governor of the city, and sometimes the archbishop. It was exceedingly large, and drawn by six white horses very richly harnessed. Other carriages followed, with the train who attended the governor and the senators.

Almost all festivals owe their origin to some extraordinary event, or some singular story either true or false. It is said, that when the splendor with which the feast of *the assumption de la Bara* was celebrated at Messina, first began to attract foreigners to the city, on that occasion such crowds repaired thither as to alarm the inhabitants with the fears of a famine: But one year, when the number of strangers was greater than usual at the time of this festival, the magistrates were very much at a loss how to supply them with provisions; and at length, every other resource failing, no hopes of relief remained but from the kindness of the Blessed Virgin. Fervent prayers were addressed to their patroness: and next morning by day-break three brigantines appeared entering the harbour with full sails. They proved to be loaded with corn. It was eagerly purchased: and the people of the city hasted to appease their hunger. But when they came after refreshing themselves to pay the corn-merchants their money, neither ships nor merchants could be found. After their first emotions of surprise had subsided, they naturally concluded that such a seasonable supply must undoubtedly be a present from the Virgin, who, being pleased with the zeal of her Messenian votaries, and desirous to prevent the concourse of strangers who attended the festival from diminishing, had interposed in this miraculous manner to save them from the distresses of famine. A new festival was celebrated in gratitude to their generous benefactress. Three small vessels of silver were made, and dedicated to the Virgin in memory of the event; and these are at present used as lamps in the cathedral. The senate likewise decreed, that the clergy should pay annually a small tax, to be laid out in constructing a small galley to swim on the fountain, and in defraying the expences of the fire-works. The profits of the clergy are so considerable on the occasion of the festival, that they may be supposed to pay the tax with great cheerfulness.

In Messina, as in the other cities of Sicily, the women wrap themselves in a large black mantle above the rest of their dress. The stuffs are richer or plainer according to rank and circumstances. People who are not rich enough to have fine cloaths of their own, hire them at so much an hour. There are women who make a livelihood by lending out their cloaths. The mantle covers the wearer from head to foot.—It reduces the old and the young, the ill-shaped and the handsome, pretty much to an equality in point of appearance. This must naturally appear very unfavourable to the influence of beauty. But yet, on proper occasions, at church or in a public walk, the ladies of Messina find means to open and adjust the mantle so as to display all their beauties of face and shape, and to attract the affections of lovers, perhaps more powerfully than if their dress were suited to display their charms in a more ostentatious manner.

Between Messina and the tower of Faro there stands a small church called the *Madona of the Grotto*. It was anciently a temple of a round structure, and ornamented with columns like the temple of the sun at Rome. Modern columns now supply the place that was occupied by the ancient. There are large niches in the rock adjoining to the temple, which are thought to be of equal antiquity. These contain no sculptured figures; but in Pagan times they might possibly contain some.

Messina being situated between mount Ætna and the gulph of Charybdis, and being likewise at no great distance from the volcanoes of Lipari and Stromboli, must have been in all ages liable to suffer by earthquakes. Such terrible events, however, appear to have been more unfrequent in ancient than in modern times, and have actually alarmed the present age oftener than any other. In the 1693 a fourth part of the cities of Sicily was destroyed by an earthquake. Messina merely felt the shock: all its buildings, however, suffered. In the year 1742 it suffered another equally violent. A plague which followed in 1743 retarded the repairs necessary after the earthquake. In the year

Messina. year 1780 this city continued, for more than six months, to suffer from a new earthquake.

Were the state of the elements, previous to these dreadful events, carefully examined, it might perhaps be found to undergo certain changes which might be considered as prognosticating them.

The autumn of the year 1782 was unusually cold and rainy. Fahrenheit's thermometer was often as low as 56 degrees. The succeeding winter was dry; and the mercury never fell under 25 degrees: And, what is uncommon in that season, storms were now and then observed to arise from the west. The pilots in the channel observed that the tides no longer rose at the usual periods, and the gulph of Charybdis raged with extraordinary fury.

On the 5th of February 1783, the air was heavy and calm; the sky obscured with thick clouds, and the atmosphere seemingly all in a flame. About half after twelve at noon, the earth began to shake with a dreadful noise. The shocks continually increased, and became at length so violent as to open the ground, and to overturn in two or three minutes a considerable part of the buildings.

A long white cloud appeared to the north-west; and soon after another, very dark, in the same quarter of the heavens. The latter in a moment spread over the whole horizon, and deluged the city with rain and hail, accompanied with dreadful claps of thunder. The inhabitants fled in the utmost terror to the fields and the ships in the harbour.

From mid-day till five in the afternoon the earthquake continued almost without interruption. The shocks then became somewhat less frequent. The cries of the dying; the shrieks of those who were half-buried under the ruins; the wild terror with which others, who were still able, attempted to make their escape; the despair of fathers, mothers, and husbands, bereft of those who were dearest to them; then formed altogether a scene of horror, such as can but seldom occur in the history of the calamities of the human race. Amid that awful scene, instances of the most heroic courage and the most generous affection were displayed. Mothers, regardless of their own safety, rushed into every danger to snatch their children from death. Conjugal and filial affection prompted deeds not less desperate and heroic. But no sooner did the earthquake cease, than the poor wretches who had escaped began to feel the influence of very different passions. When they returned to visit the ruins, to seek out the situation of their fallen dwellings, to inquire into the fate of their families, to procure food and collect some remains of their former fortunes—such as found their circumstances the most wretched became suddenly animated with rage, which nothing but wild despair could inspire. The distinction of ranks, and the order of society were disregarded, and property eagerly violated. Murder, rapine, and lawless robbery, reigned among the smoking ruins.

About one in the morning another shock of the earthquake was felt, which overturned most of the houses that were still standing. Most of those whom want, or avarice, or humanity, still detained among the ruins, now shared the same fate with their friends whom the former shocks had buried under them.

The succeeding day scarce alleviated the distress of this dismal night: the few wretches who still survived found themselves destitute of every necessary. At length order was in some degree re-established; and in two days after every person was supplied at least with some small portion of the necessaries for subsistence. Messina.

None yet thought of returning to take up their abode among the ruins. The common people fixed their residence on the plain of Porto Salvo, near the town of Salleo. The nobles, magistrates, and merchants, took up their abode on another plain, on the other side of the stream Porta de Legno; the soldiers at Terra Nuova.

Some violent shocks which were again felt on the 7th of February and the 28th of March completed the destruction of the city. The corn magazines, however, escaped without damage; and the public ovens and the aqueducts were but little injured. From these facts it may perhaps be inferred, that had not the houses of Messina been, in general, hastily built at the first, and afterwards carelessly repaired, fewer of them would have been overthrown by the earthquake.

The neighbouring villages having suffered but little, were the first to relieve the remaining inhabitants of Messina in their distress. Maltese galleys for some days supplied necessaries to the poor and the sick with a generosity which merits the highest praise. They brought surgeons and whatever was needful for the cure of the wounded. The supplies sent by the king of France were refused, for what reason we know not. What money was needed for the support of the people was taken from the treasury of the city of Messina; for what the king of Naples sent was seized and spent by the garrison.

It is said that not more than 800 or 900 persons perished by this earthquake. The sea during that convulsion of the land was slightly agitated in the harbour. Farther out the sea was more violently agitated; but none of the ships in the harbour were dashed to pieces. The waters rose so high as to be injurious in a very considerable degree to Pharo, as well as along the coast of Scylla and Bagnara.

This earthquake was not of a momentary duration, like that by which Lisbon was destroyed, and like many others: for more than sixty days, from the 5th of February to the beginning of April, Messina continued to be shaken; and in that time felt more than 200 shocks. And ever after that period the alarm was again and again renewed. Not only the magistrates, the soldiers, and the people, but the priests likewise, with their tabernacle and altar, retired to the barracks. The nuns, too, deserted their cloister, and sought a retreat without the walls. Some of them confined themselves to the gardens of their convents; others mixed indiscriminately with the people.

The chief damage which the public buildings within the city suffered was the fall of the dome of the church of Purgatory. Only the walls were left standing: and even these had suffered considerably One half of the steeple of the cathedral was beaten to the ground. The magazines of Porto Franco were likewise very much shattered. The fort of St Salvator, being built on an artificial foundation, the side next the sea is there fallen down; but on the other side, where it is founded

Meffina || Metacarpus.

founded on a rock, it has ftood unmoved by all the fhocks of the earthquake.

On the 5th of February, when the earthquake was more violent than at any time afterwards, a ftrong fmell of fulphur was felt. The earth was affected fomewhat in the fame way as if it had been borne upon a fluid; and feemed to reel with the fhocks much like a fhip toffed with the waves. This tremulous motion was felt all over Sicily; but towards Pharo it became weaker. On the following days the fky was cloudy; the mountains of Sicily and the fhores of Calabria continued covered with a thick fog like fmoke. North and north-eaft winds raged with the moft violent impetuofity.

The difaftrous year of this earthquake was fcarce concluded, the chafms which it had opened in the ground were ftill yawning, and the poor inhabitants of the adjacent country ftill trembled with terror, when the elements again renewed their fury to ravage this miferable land.

On Tuefday the 6th of January 1784, about funrife, the wind began to blow foftly from the northeaft. The fea gradually fwelled, rofe beyond its bed with rapid impetuofity, overflowed the quay of Meffina, and lafhed with its billows the ruins of the Palazzata. It loofened and difplaced many of the ftones of the mole, fpread over the whole ftreet, and attacked the pedeftals of the ftatues which had been fpared by the earthquake, and ftill ftood firm among the ruins. The fame furious wind which fwelled the fea in fo extraordinary a manner, ravaged the whole coaft from Meffina all the way to Syracufe.

MESSUAGE, Messuagium, in law, a dwelling-houfe, with fome land adjoining affigned for its ufe. By the name of *meffuage* may a garden, fhop, mill, cottage, chamber, cellar, or the like, pafs.—In Scotland, *meffuage* denotes what is called in England the *manor houfe*, viz. the principal dwelling-houfe within any barony.

MESOPORPHYRON, a name given by the Greeks to the Roman *laticlave*; becaufe that garment, being edged on each fide, where it opened before, with purple, appeared when clofed with two purple ftripes down the middle. The fame term was alfo applied to the *anguficlave*.

META, in the Roman circus, was a pile of ftones of a pyramidical form, intended as a boundary of the *ftadium*, or chariot-courfe.—When the meta was paffed the feventh time, the race was concluded. The greateft art and management were required in avoiding the meta, and yet going as near it as poffible. If they went too near, they were in the greateft danger of breaking the chariot to pieces; and if they took too large a circuit in the turn, they gave their rivals an opportunity of getting within them, befides lofing a great deal of ground. The boundary of the Grecian *ftadium*, or courfe, was called τελος, τερμα, γραμμη and αργα γραμμη; to which laft name Horace probably alludes in calling death, "*ultima linea rerum*."

The *metæ* at Rome were firft of wood, afterwards of ftone; but the emperor Claudius made them of gold, or rather gilded them. In the Roman circus there were two *metæ*, one at the entrance of the courfe, and the other at the end of it. An egg was placed upon the top of the *metæ*.

METACARPUS, or Metacarpium, (from μετα *behind*, and καρπος, *hand*), in anatomy, that part of the hand between the wrift and the fingers. See Anatomy, n° 55.

Metagitnion, Metal

METAGITNION, the fecond month of the Athenian year, anfwering to the latter part of our July and the beginning of Auguft, and fo called from *metagitnia*, a feftival in honour of Apollo, which was kept in it. The Bœotians called this month *panemus*, and the Syracufans, *carnius*.

METAL, in natural hiftory, a fimple, ponderous, fhining, fixed, opake body, that fufes and becomes fluid by fire, and by cold coagulates and hardens into a folid mafs, capable of being diftended under the hammer. See Metallurgy, and Chemistry.

Metal, in heraldry. There are two metals ufed in heraldry, by way of colours, viz. gold and filver, in blazon called *or* and *argent*.

In the common painting of arms thefe metals are reprefented by white and yellow, which are the natural colours of thofe metals. In engraving, gold is expreffed by dotting the coat, &c. all over; and filver, by leaving it quite blank.

It is a general rule in heraldry, never to place metal upon metal, nor colour upon colour: fo that if the field be of one of the metals, the bearing muft be of fome colour; and if the field be of any colour, the bearing muft be one of the metals.

Metals, Solution of. See Chemistry-*Index*.

On this fubject Mr Keir has fome curious obfervations in the Philofophical Tranfactions for 1790. He takes notice, that the word *folution* has two meanings; one expreffive of the act of diffolving, as when we fay that "folution is a chemical operation;" and the other, when it is put for the fubftance diffolved in the acid, as "a folution of filver in the nitrous acid." To avoid confufion, therefore, he ufes the word *folution* to exprefs the fubftance diffolved, together with its folvent; *diffolution* being the term made ufe of when the act of diffolving is meant. He continues the ufe of the terms *phlogifticated* and *dephlogifticated* to exprefs certain ftates of the acids, but without reference to theory of any kind.

In diffolving metals, our author obferves, that the properties of the feveral acids have been inveftigated with confiderable fuccefs; and even one compound, viz. that of fpirit of nitre and fpirit of falt, commonly called *aqua regis*, is well known on account of its quality of diffolving gold. A vaft field, however, yet remains for examination in the other acids, whether mixed together, or poffeffing various degrees of concentration, temperature, or phlogiftication. Thus, tho' no two fubftances are more frequently in the hands of chemifts than vitriolic acid and nitre, yet the properties of the mixture had not been inveftigated before Mr Keir made his experiments; and upon trial he found, that this mixture poffeffed certain properties which neither the vitriolic nor nitrous acids fingly poffefs. The refults of his experiments on this fubject are as follow.

1. In a long-necked retort containing 1400 grain meafures, 100 grains of oil of vitriol of the fpecific gravity of 1.844 were put along with 100 grains of pure nitre, and the falt diffolved in the acid by means of a water-bath. On applying a boiling heat, the filver began to diffolve, and the folution affumed a purple or

Metal.

or violet colour; but no air was extricated. An end was put to the operation (by the rushing in of the water used in the pneumatic apparatus applied to the retort) when 39 grains of silver had been dissolved.

2. To 100 grains of nitre previously dissolved in an equal quantity of vitriolic acid, 200 grains of standard silver were added; of which 92 grains were dissolved without the production of any air or gas: but upon pouring in 200 grains of water into the retort, a violent effervescence took place, and 3100 measures of nitrous gas were thrown off; and on adding 200 grains more, a farther emission of 600 grain measures ensued; but no more was emitted on the addition of more water, nor did any farther dissolution of the metal take place than two grains. The same phenomena took place in various proportions, according to the different quantities of acid and metal made use of.

On substituting tin for silver, none of the metal was dissolved or calcined by mixtures in the proportion of 200 grain measures of oil of vitriol to as much nitre, nor by 200 of the vitriolic acid to 150 of nitre: but with a proportion of 200 measures of the acid to 100 grains of nitre, the tin soon began to be acted upon, and diffused through the liquor; but no gas was extricated till the digestion had been continued in boiling water for two hours. The tin was still only calcined, not dissolved; 8500 grain measures of nitrous gas were extricated, and 73 grains of the metal reduced to a white powder. On pouring into the retort 200 grains of fresh water, a new effervescence took place betwixt the water and white powder, by which 4600 grain measures of nitrous gas were thrown off. The action of the menstruum was greatly promoted by augmenting the quantity of oil of vitriol, and adding water to the mixture.

By this mixture quicksilver was calcined to a grey powder, nickel was also partly calcined and partly dissolved; but no other metal was much affected, tho' the surfaces of some of them were tarnished. The mixtures themselves were very apt to congeal, especially where there was a large proportion of nitre; and their properties are much altered by the addition of water. Thus, in their concentrated state, they do not act upon iron; but by adding water, it acquires the property of acting upon that metal, and in different degrees according to the quantity of water added. Thus, by adding two measures of the compound acid to one of water, the liquor is rendered capable of calcining iron, and forming with it a white powder, but without any effervescence. An equal measure of water produces effervescence; and with a larger proportion of water the iron acquires a yellow or brown colour, such as phlogisticated nitrous acid acquires from iron, or communicates to a solution of martial vitriol in water. Dilution with water renders this compound acid capable of dissolving copper and zinc, neither of which it will touch in its concentrated state.

From this property of the compound acid not dissolving copper, but very readily silver, we have an easy method of separating the two metals from each other. This might be useful in many cases; but is particularly so in Birmingham, where great numbers of copper vessels covered with silver are manufactured. Thus there are always a great number of cuttings or small bits called *scraps*, which are of no use but to separate the two metals from one another. The easiest method of doing this is an object of some consequence. Two methods have been generally practised for this purpose: one is by melting the whole mass of metal with lead, and separating them by means of eliquation and testing; the other is by dissolving both metals in vitriolic acid, and then separating the solution of copper from the vitriol of silver. The disadvantage of the former method is, the quantity of lead and copper wasted; and of the latter, that of vitriolic acid. The virtues of a mixture of oil of vitriol and nitre were some time ago communicated by Mr Keir to an artist at Birmingham; and it is now generally used there to effect the separation of the two metals. The method of using it is very easy; nothing more being requisite than to put the pieces of plated metal into a glazed earthen pan, and to pour upon them some of the acid liquor, which may contain about one pound of nitre to eight or ten of oil of vitriol. Stir them about, and assist the action by an heat from 100 to 200 of Fahrenheit's scale. When the liquor is nearly saturated, the silver may be precipitated in the form of *luna cornea* by common salt; or it may be obtained in its metallic form by adding to the liquor some pieces of copper, and as much water as will enable it to act upon them. He is of opinion, that the menstruum may be useful in all separations of silver from other metals. The name he seems to wish to impose upon it is *aqua regina*. The following are the conclusions drawn from the experiments on these mixtures by our author.

1. A mixture of the vitriolic and nitrous acids dissolves silver plentifully.

2. It acts upon tin, and mostly calcines it, as well as mercury and nickel; having little or no action upon other metals.

3. The quantity of gas produced while the metal is dissolving, is greater, relatively to the quantity of the metal dissolved, when the proportion of nitre to the vitriolic acid is small, than when it is large; and when the metals are dissolved by mixtures containing much nitre with a small production of gas, the solution itself, or the metallic salt formed in it, yields abundance of gas when mixed with water.

4. Dilution with water renders the concentrated mixture less capable of dissolving silver, but more so of acting upon other metals.

5. This mixture of highly concentrated vitriolic and nitrous acids, acquires a purple or violet colour when phlogisticated, either by the addition of inflammable substances as sulphur, or by its action on metals, or by very strong impregnation of oil of vitriol with nitrous gas.

6. By means of this phlogistication the mixture acquired a property of dissolving, though in small quantities, copper, iron, zinc, and regulus of cobalt.

7. Water expels a vast quantity of nitrous gas from a concentrated mixture of vitriolic acid and nitre impregnated with it; but this fluid unites with a mixture of oil of vitriol and nitre without any considerable effervescence.

By adding to the mixture of oil of vitriol and nitre a solution of common salt, a very powerful *aqua regia* is formed, capable of dissolving gold and platina; and which, Metal. which, though perfectly free from all metallic matter, acquires at once a deep yellow colour. Dry common salt added to the concentrated mixture produces an effervescence, but no yellow colour.

Metalepsis Metallisation.

METALEPSIS. See ORATORY, n° 59.

METALLISATION, the natural process by which metals are formed in the bowels of the earth. See METALLURGY, sect. i.

METALLURGY.

METALLURGY, according to Boerhaave, comprehends the whole art of working metals, from the glebe or ore to the utensil; in which sense essaying, smelting, refining, parting, smithery, gilding, &c. are only branches of metallurgy. But, in the present work, Gilding, Parting, Purifying, Refining, Smithery, &c. are treated under their proper names. With others, therefore, we have chosen to restrain *Metallurgy* to those operations required to separate metals from their ores for the uses of life. These operations are of two kinds: the smaller, or Essaying; and the larger, or Smelting. But a particular description of the ores themselves seemed likewise necessary to be given; and to this place, too, we have referred a general account of metals, metallisation, mines, and ores, as a proper introduction to the subject. Hence the following division into three parts. The *first* treating, 1. Of metals and metallisation. 2. Of mines and ores in general. 3. Of the pyrites. 4 Of the essaying of ores in general. The *second*, Of the particular ores, and the methods of essaying them. The *third*, Of smelting of ores, or the methods of extracting metals from large quantities of ores for the purposes of commerce or manufacture.

PART I.

SECT. I. *Of Metals and Metallisation.*

UNDER the general name *metal*, we comprehend here not only the metals properly so called, but also the *semimetals*, or all matters which have the essential metallic properties which we shall here recount. Thus the word *metal* and *metallic substance* will be synonymous in this article.

Metallic substances form a class of bodies, not very numerous, of very great importance in chemistry, medicine, arts, and the ordinary affairs of life. These substances have very peculiar properties, by which they differ from all other bodies.

The natural bodies from which metals differ the least are, earthy and pyritous matters, on account of their solidity and density. Metals and stones are, nevertheless, very different; the heaviest stones which are unmetallic being much lighter than the lightest metals. A cubic foot of marble weighs 252 pounds; and an equal bulk of tin, the lightest of metals, weighs 516 pounds. The difference is much greater when the weight of such stone is compared with that of gold, a cubic foot of which is 1326 pounds.

Opacity is another quality which metals possess eminently, the opacity of metals being much greater than that of any unmetallic substance.

This great opacity of metals is a consequence of their density; and these two properties produce a third, peculiar also to metals, namely, a capacity of reflecting much more light than any other body: hence metals whose surfaces are polished, form mirrors representing the images of bodies more clearly than any other matter. Thus looking-glasses produce their reflection merely by the silvering, which is a covering of metal on their surfaces. To this reflective property metals owe their peculiar lustre, called the *metallic lustre*.

Although the several metallic substances differ considerably in hardness and fusibility, we may say in general, that they are less hard and less fusible than pure earths

Metals cannot unite with any earthy substance, not even with their own earths, when these are deprived of their metallic state: hence, when they are melted, they naturally run into globes, as much as the absolute gravity of their mass, and their pressure upon the containing vessels, will allow. Accordingly, the surface of a metal in fusion is always convex. A metal in that state always endeavours to acquire a spherical form, which it does more perfectly as the mass is less. This effect is very sensible in quicksilver, which is nothing but a metal habitually fluid or fused. A mass of several pounds of mercury, contained in a shallow wide-mouthed vessel, is so spread out, that its upper surface is almost flat, and the convexity is not very sensible but at its circumference: on the contrary, if we put very small masses of mercury into the same vessel, as, for instance, masses weighing a grain each, they become so round as to seem perfect globes. This effect is partly occasioned by the inaptitude of metals to unite with the vessels containing them when in fusion, by which quality the whole affinity which subsists betwixt the integrant parts of these metals is capable of acting; and partly also by this affinity, which disposes the integrant parts to come as near to each other as they can, and consequently to form a sphere.

This property is not peculiar to melted metals, but to all fluids, when contiguous to bodies solid or fluid, with which they have no tendency to unite. Thus, for instance, masses of water upon oily bodies, or oily masses upon bodies moistened with water, assume always a form so much nearer to the spherical as they are smaller. Even a large drop of oil poured upon a watery liquor, so that it shall be surrounded with this liquor, becomes a perfect sphere.

All metals are in general soluble by all acids; but often these solutions require particular treatment and circumstances, which are mentioned under CHEMISTRY. With acids, they form a kind of neutral salts, which have

have all more or less causticity. The affinity of metals is less than of absorbent earths and alkaline salts to acids; and therefore any metal may be separated from any acid by these substances.

Alkaline salts are capable of acting upon all metallic substances, and by proper management will keep them dissolved.

Metals may in general be united with sulphur and liver of sulphur. With sulphur they form compounds resembling the peculiar substance of ores, which are generally nothing else than natural combinations of sulphur and metal. Metals have less affinity with sulphur than with acids; hence sulphur may be separated from them by acids. Some exceptions from these general rules, concerning the affinity of metals to sulphur and liver of sulphur, and concerning their separation from sulphur by acids, may be seen under the articles of the several metals. But these exceptions do probably take place, only because we have not yet found the method of surmounting some obstacles which occur in the ordinary methods of treating certain metals.

All metals may in general be united with each other, with which they form different allays which have peculiar properties; but this rule also is not without some exceptions.

Metals have a strong affinity with the inflammable principle, and are capable of receiving it superabundantly.

Lastly, oily substances seem to be capable of acting upon all metals. Some metals are easily and copiously dissolved by oils; and perhaps they might all be found to be entirely soluble in oils, if the methods known in chemistry were tried for the accomplishment of these solutions.

The properties above mentioned agree in general to all metallic substances: but, besides the properties peculiar to each metal, some properties are common to a certain number of them; and hence they have been divided into several classes.

Those metallic matters which, when struck by a hammer, or strongly compressed, are extended, lengthened, and flattened, without being broken (which property is called *ductility* or *malleability*), and which also remain fixed in the most violent and long continued fire, without diminution of weight, or other sensible alteration, are called *perfect metals*. These perfect metals are three; *gold, silver, platina*.

The metallic matters which are ductile and fixed in the fire, to a certain degree, but which are destroyed by the continued action of fire, that is, changed into an earth deprived of all the characteristic properties of metals, are called *imperfect metals*. Of this kind are four; *copper, iron, tin, lead*.

The metallic substances which, as well as the imperfect metals, lose their metallic properties by exposure to fire, but which also have no ductility nor fixity, are distinguished from the others by the name of *semi-metals*. Of this class are seven; *regulus of antimony, bismuth, zinc, nickel, regulus of cobalt, regulus of arsenic*, and of *manganese*.

Lastly, *mercury*, which has all the general properties of metals, makes a class separate from the others; because in purity and gravity it is similar to the perfect metals, and in volatility to the semi-metals. Its fusibility also so far surpasses that of any other metallic matter, that it is sufficient to distinguish it from all, and to give it a distinct class. We have enumerated, therefore, in all, 15 metallic substances; four of which were unknown to the ancients, namely, platina, regulus of cobalt, of manganese, and nickel.

As chemists can compound bodies by being capable of separating the principles of such bodies, and even of re-uniting their principles so as to reproduce such compounds as they were originally; and as hitherto they have not been able to accomplish any such decomposition upon the perfect metals: hence, if all the other metallic substances were equally unalterable, we should be very far from having certain notions concerning metals in general: but if we except gold, silver, and platina, all the other metallic matters are susceptible of decomposition and of recomposition, at least to a certain degree; and experiments of this kind have thrown much light on the subject.

We may observe, that even if we had not been able to decompose any metallic substance, we might still, by reflecting on the essential properties of metals, discover sufficiently well the nature of their principles.

The solidity, the consistence, and especially the gravity, which they possess in a degree so superior to all other bodies, would not have allowed us to doubt that the earthy element, of which these are the characteristical properties, enters largely into their composition, and makes their basis.

The facility with which they combine with almost all inflammable matters, and with all those which have great affinity with phlogiston, such as acids; joined to their incapacity of being allayed with meagre matters that are purely earthy or purely watery, which have no disposition to unite with phlogiston; would also have furnished very strong motives to believe, that the inflammable principle enters largely into the composition of metals.

The destructible metals present exactly the same phenomena as all other bodies containing the inflammable principle do, in the state of combustion. When exposed to fire, without access of air, that is, in close vessels, they become red-hot, melt, or sublime, according to their nature: but they receive no alteration in their composition from fire applied in this manner, and they are afterwards found to be exactly in the same state as before. In this respect, they resemble perfectly all bodies which contain no other inflammable matter than pure phlogiston.

But when imperfect metals are exposed to fire, with access of air, as, for instance, under a muffle in a furnace which is made very hot, then they burn more or less sensibly, as their inflammable principle is more or less abundant, or more or less combined. Some of them, as iron and zinc, burn with a very lively and brilliant flame; but this flame is of the same nature as that of charcoal, of sulphur, of all bodies, the combustible principle of which is pure phlogiston, and is not in an oily state, that is, furnishes no soot capable of blackening.

The imperfect metals detonate with nitre, and their phlogiston is consumed by this method much more quickly and completely than by ordinary calcination or combuſtion. Their flame is alſo much more lively and brilliant: and ſome of them, as iron and zinc, are uſed in compoſitions for fireworks from their very vivid and beautiful flame.

Nitre is alkaliſed by theſe metallic detonations exactly in the ſame manner as in its detonation by coals.

Laſtly, imperfect metals being treated with acids which have an affinity with phlogiſton, that is, with the vitriolic and nitrous acids, are deprived by theſe acids of a more or leſs conſiderable part of their inflammable principle; they give a ſulphureous quality to vitriolic acid, and are even capable of producing ſulphur with that acid.

Although the experiments now mentioned were the only proofs of the exiſtence of an inflammable principle in metallic ſubſtances, they would be ſufficient to eſtabliſh it inconteſtably. But we ſhall ſee, when we continue to examine the phenomena attending the decompoſition of metals, that thoſe are not the only proofs.

If the inflammable matter which ſhows itſelf ſo evidently in the burning of metals, is really one of their conſtituent parts, their eſſential properties muſt be altered in proportion to the quantity of it taken from them: and this evidently happens upon trial: for the reſiduum of metallic matters, after calcination, departs from the metallic character, and approaches to the nature of mere earth. The opacity, brilliancy, ductility, gravity, fuſibility, volatility, in a word, all the properties by which metallic ſubſtances differ from ſimple earths, diminiſh or entirely diſappear, by taking from them their inflammable principle; ſo that when their calcination has been carried as far as is poſſible, they reſemble mere earths, and have no longer any thing in common with metals. Theſe earths can no longer be combined with acids or with metals, but are capable of uniting with pure earths. They are then called *calxes* or *metallic earths*. See CHEMISTRY.

We muſt obſerve concerning the decompoſition of metals, 1. That when a ſmall quantity of inflammable principle is taken from metals, only a ſmall quantity of calx is formed, and the remaining part continues in the metallic ſtate: hence, as the portion of calcined matter can no longer remain united with that which is deſtroyed, it ſeparates in form of ſcales from the ſurface of the metal when the calcination has been performed without fuſion, as generally happens to iron and to copper: or theſe ſcales float upon the ſurface of the melted matter when the calcination is performed during fuſion, becauſe the calx is ſpecifically lighter than the metal; as happens to the very fuſible metals, as tin, lead, and moſt of the ſemimetals.

2. The imperfect metals are not all equally eaſily and completely calcinable. In general, as much of their phlogiſton may be eaſily taken from them, as is ſufficient to deprive them of their metallic properties; but the remaining portion of their phlogiſton cannot be ſo eaſily driven off. Some of them, as copper, reſiſt the firſt calcination more than the reſt; and others, as lead and biſmuth, may be very eaſily calcined, but only to a certain degree, and retain always obſtinately the laſt portions of their inflammable principle; laſtly, others, as tin and regulus of antimony, may not only be eaſily and quickly calcined, but alſo much more completely. All the other metals partake more or leſs of theſe properties relating to their calcination. In general, if we except the labours of alchemiſts, which are not much to be depended upon, we have not yet made all the proper efforts to arrive at a perfect calcination of the ſeveral metallic ſubſtances; which, however, is abſolutely neceſſary, before we can arrive at a complete knowledge of the nature of their earths, as we ſhall afterwards ſee.

When metallic earths have loſt but little of their phlogiſton, and are expoſed to ſtrong fire, they melt, and are reduced to compact maſſes, ſtill heavy and opake; although much leſs ſo than the metals, and always brittle and abſolutely unmalleable. If the calcination has been more perfect, the metallic earths are ſtill fuſible by fire, but leſs eaſily, and convertible into brittle and tranſparent maſſes poſſeſſed of all the properties of glaſs, and are accordingly called *metallic glaſſes*. Theſe glaſſes do not poſſeſs any of the properties of their metals, excepting that they are ſpecifically heavier than other glaſſes, that they are capable of being attacked by acids, and that the glaſſes of the ſemimetals are ſomewhat leſs fixed than unmetallic glaſſes. Laſtly, when the calcination of metals has been carried to its greateſt height, their earths are abſolutely fixed, and unfuſible in the fire of our furnaces, and poſſeſs no longer the ſolubility in acids by which metals are characteriſed.

Theſe are the principal changes which metals ſuffer by loſing their phlogiſton. They are thus changed into ſubſtances which have no properties but thoſe of earth. This is a certain proof that the inflammable principle is one of their conſtituent parts. But we have alſo other proofs of this important truth. The reduction of metallic calxes into metal, by the addition of phlogiſton alone, completes the proof; and the whole forms one of the cleareſt and moſt ſatisfactory demonſtrations in all the ſciences. This reduction is effected in the following manner:

If the earth of a metal be mixed with any inflammable matter, which either is or can be changed into the ſtate of coal, together with ſome ſalt capable of facilitating fuſion, but which, from its quantity or quality, is incapable of receiving the inflammable principle; and if the whole be put into a crucible, and the fuſion promoted by a fire gradually raiſed; then an effervescence will happen, accompanied with a hiſſing noiſe, which continues a certain time, during which the fire is not to be increaſed; afterwards, when the whole has been well fuſed, and the crucible taken from the fire and cooled, we ſhall find at the bottom, upon breaking it, the metal, the earth of which was employed for the operation, poſſeſſed of all the properties which it had before calcination and reduction.

We cannot doubt that this transformation of an earthy ſubſtance into a metal, is ſolely cauſed by the phlogiſton paſſing from the inflammable matter to the metallic earth. For, firſt, in whatever manner and with whatever ſubſtance metallic earths be treated, they cannot be ever reduced into metals without a concurrence of ſome ſubſtance containing phlogiſton. 2dly, The nature of the ſubſtance which is to furniſh phlogiſton is quite indifferent, becauſe this principle is the ſame in all bodies containing it. 3dly, If, after the

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the operation, the substance furnishing the phlogiston be examined, we shall find that it has lost as much of that principle as the metallic earth has received. See Phlogiston.

The facts related concerning the decomposition and the recomposition of metals, prove incontestably that they are all composed of earth and phlogiston. But we do not yet certainly know whether these two be the only principles of metals. We might affirm this, if we could produce metals by combining phlogiston with some matter which is certainly known to be simple earth. But this hitherto has not been accomplished; for if we try to treat any earth, which has never been metallic, with inflammable matters, we shall perceive that the simple earths are not combinable with phlogiston so as to form metals. We shall even perceive that the metallic earths resist this combination, and are incapable of reduction into metal, when they have been so much calcined as very nearly to approximate the nature of simple earths.

These considerations, added to this, that we cannot easily conceive how, from only two certain principles, so many very different compounds as the several metallic substances are, should result, are capable of inducing a belief that some other principle is added to these two already mentioned in the composition of metals.

Many great chemists, and particularly Becher and Stahl, seem to be of this opinion. Chiefly from the experiments concerning the mercurification of metals, they believe that this third principle exists copiously in mercury; that it is of a mercurial nature; that it also exists in marine acid, to which it gives its specific character; that, by extracting this mercurial principle from marine acid, or any other body containing it copiously, and by combining it with simple earths, these may acquire a metallic character, and be rendered capable of receiving phlogiston, and of being completely metallised.

These chemists admit also, and with probability, a different proportion of metallic principles in the several metals; and believe, that particularly the principle which they call *mercurial earth*, exists more copiously and sensibly in certain metals than in others. The most mercurial metals, according to them, are mercury, silver, lead, and arsenic. Most chemists distinguish them from the other metals, which they call *white metals*, *lunar metals*, or *mercurial metals*.

All these considerations being united, and others too many to be mentioned, give some probability to the existence of the mercurial principle in metals. We must however acknowledge, that the existence of this principle is merely probable; and, as Stahl observes, is not nearly so well demonstrated as that of the inflammable principle: we may even add, that we have strong motives to doubt of its existence.

To produce metals artificially has justly been reckoned one of the most difficult problems in chemistry.

Metallic substances, although they resemble each other by their general properties, differ nevertheless from each other very evidently by the properties peculiar to each. Do these differences proceed from the different proportion, and from the more or less intimate connection of the inflammable principle with the earthy principle, supposing that this latter should be essentially the same in all metals? or ought they to be attributed to the difference of earths, which in that case would be distinct and peculiar to each metal? or, lastly, do metals differ from each other, both by the nature of their earths, and by the proportion and intimacy of connection of their principles? All these things are entirely unknown; and we may easily perceive, that till they are known, we cannot discover what method to pursue in our attempts to accomplish the combinations we are now treating of.

The most essential point then is, to arrive at a knowledge of the true nature of the earths which are in metals; and the only method of arriving at this knowledge is, by reducing them to their greatest simplicity by a perfect calcination. But this cannot be accomplished but by long and difficult operations. We have seen above, that all metals are not calcinable with equal ease; that the perfect metals have not been hitherto calcined truly by any process; and that, in general, the last portions of phlogiston adhere very strongly to calcinable metals.

Some metals, however, as tin and regulus of antimony, may be easily calcined so as to be rendered irreducible. By carrying the calcination still further, we might obtain their earths so pure, that all their essential properties may be discovered, by which they might be easily compared together. This comparison would decide whether their nature be essentially different or not.

If they were found to be composed of earths essentially the same, we might next proceed to compare metallic with unmetallic earths. If the former were found similar to some of the latter kind, we should be then assured that the earth of metals is not peculiar to them, and that ordinary unmetallic earths are susceptible of metallisation. From some late experiments, it was imagined that lime and magnesia alba were capable of being converted into metallic substances, but the processes are now found to be erroneous.

The greater the number of metals operated upon, the more general and certain the consequences resulting from these would be: so that, for instance, if the operation were extended to all calcinable metals; and if the result of each of these operations were, that the calxes, when perfectly dephlogisticated, do not differ from each other, and are similar to earths already known; we might conclude from analogy, and we should be almost certain, that the earths of the perfect metals are also of the same nature.

They who know the extent and difficulties of chemical operations, will easily perceive that this would be one of the most considerable. Nevertheless, after having determined this essential point, we should only have done half our work: For a knowledge of the nature of the earth of metals, and where it is to be found, would not be sufficient; we must further endeavour to find a method of combining with this earth a sufficient quantity of phlogiston, and in a manner sufficiently intimate, that a metal might be formed by such a combination. But this second difficulty is perhaps greater than the former.

We must observe here, that some famous chemical processes have been considered by many as metallisations, but which are really not so. Such is Becher's famous experiment of the *minera arenaria perpetua*, by which that chemist proposed to the States-General to extract gold from any kind of sand. Such also is the process of Becher and of Geoffroy, to obtain iron from

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from all clays by treating them with linseed oil in close vessels. In these, and many other such processes, we only obtain metal that was already formed. Every earth and sand, as the intelligent and judicious Cramer observes, contains some particles of gold. Clays do not commonly contain iron ready formed: but all of them contain a ferruginous earth, naturally disposed to metallisation. (See CLAY.) Accordingly we must conclude, that, by Mr Geoffrey's experiment, iron is only reduced or revived, but is not produced.

The great difficulties which occur in attempting to give a metallic quality to simple earths have induced a belief, that the nature of metals ready formed might be more easily changed, and the less perfect brought to a more perfect state. To effect this, which is one of the principal objects of alchemy, and is called *transmutation*, numberless trials have been made. As we have not any certain knowledge of what occasions the specific differences of metallic substances, we cannot decide whether transmutation be possible or not. In fact, if each metallic substance have its peculiar earth, essentially different from the earths of the others, and consequently if the differences of metals proceed from the differences of their earths; then, as we cannot change the essential properties of any simple substance, transmutation of metals must be impossible. But if the earths and other principles of metals be essentially the same, if they be combined in different proportions only, and more or less strictly united, and if this be the only cause of the specific difference of metals; we then see no impossibility in their transmutation.

Whatever be the cause of the differences of metals, their transmutation seems to be no less difficult than the production of a new metallic substance; and perhaps it is even more difficult. Alchemists believe that transmutation is possible, and they even affirm that they have effected it. They begin by supposing that all metals are composed of the same principles; and that the imperfect metals do not differ from gold and silver, but because their principles are not so well combined, or because they contain heterogeneous matters. We have then only these two faults to remedy, which, as they say, may be done by a proper coction, and by separating the pure from the impure. As we have but very vague and superficial notions concerning the causes of the differences of metals, we confess that we cannot make any reasonable conjecture upon this matter; and we shall only advise those who would proceed upon good principles, to determine previously, if metals have each a peculiar earth, or only one common to them all. In the second place, if it should be demonstrated that the earthy principle is the same in all metals, and if that be demonstrated as clearly as the identity of the inflammable principle in metals is proved; they must then determine whether these two be the only principles in metals, whether the mercurial principle exists, and whether it be essential to all metals or to some only, and what is the proportion of these two or three principles in the several metallic substances. When we shall clearly understand these principal objects, we may then be able to determine concerning the possibility of transmutation; and if the possibility should be affirmed, we shall then begin to discover the road which we ought to pursue.

We have no reason to believe that any other principle enters into the composition of metals than those above-mentioned; no vestige is perceptible of either air or water. Some chemists have nevertheless advanced that they contain a saline principle. If that were true, they would also contain a watery principle. But all the experiments adduced to prove this opinion are either false, or only show the presence of some saline particles extraneous to the metals, or contained unknown to the chemists in the substances employed in the experiments. For metals perfectly pure, subjected to all trials with substances which do not contain and which cannot produce any thing saline, do not discover any saline property. We must however except arsenic, and even its regulus, these being singular substances, in which the saline are as sensible as the metallic properties.

Arsenic seems to be one of those intermediate substances which nature has placed in almost all its productions betwixt two different kinds, and which partake of the properties of each kind. Arsenic thus placed betwixt metallic and saline substances has properties common to both these kinds of substances, without being either entirely a metal or salt. See ARSENIC.

As water seems to act to a certain degree upon iron, even without the concurrence of air, as the operation of *martial ethiops* shows, we might thence suspect something saline in that metal. Nevertheless, what happens in that operation has not been so well explained, that any certain consequences can be deduced. 1. The water employed ought to be perfectly pure; that is, distilled rain-water. 2. The iron employed ought also to be perfectly pure, and such is very difficultly to be procured. 3. The operation ought to be performed in a bottle accurately closed, that we may be assured that the air contributes nothing to the action upon the iron. 4. After the water has remained a long time, suppose a year, upon the iron, it ought to be carefully filtrated and examined, to ascertain whether it really has dissolved any part of the metal.

In the mean time, we may conclude that metals do not seem to contain any saline principle. And when we consider well their general properties, they seem to be nothing else than earths combined more or less intimately with a large quantity of phlogiston. Although we can demonstrate that their inflammable principle is not in an oily state, and that it is pure phlogiston, they have nevertheless an oily appearance, in this circumstance, that they adhere no more than oils to earthy and aqueous substances, and that they always assume a globular figure when supported by these substances entirely free from phlogiston.

This resemblance is so sensible, that chemists, before they knew the nature of phlogiston, believed that metals contained an oily and fat matter. The cause of this quality of metals is the quantity of phlogiston which they contain. Sulphur, phosphorus, oils, and even fats, have this appearance merely from the inflammable principle which enters into their composition: for this property is communicated by that principle to every compound which contains a certain quantity of it. See PHLOGISTON.

When the phlogiston combines copiously and intimately with earthy matters so as to form metals, it

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probably so disposes them, that the primitive integrant parts of the new compound, that is, of the metal, approximate and touch each other much more than the integrant parts of simple earths can. This is proved by the great density or specific gravity, and other general properties, of metals.

In fact, as we cannot conceive that a body should be transparent, unless it have pores and interstices through which rays of light can pass; therefore the more dense a body is, that is, the fewer such interstices it has, the less transparent it will be; so that the densest bodies ought to be the most opaque as in metals. The disposition of the pores of bodies contributes also much to their greater or less transparency; and bodies, the pores of which are continued and straight, are more transparent than those whose pores are interrupted, transverse, or oblique; so that a body may be much more transparent than another which is less dense, as we see that glass is more transparent than charcoal. But when other circumstances are equal, the densest bodies are the most opaque. Therefore the opacity of bodies is proportionable to their density, and to the deviation of their pores from right and parallel lines.

From the great opacity of metals, they probably possess both these qualities in an eminent degree. We have seen, at the beginning of this article, that the lustre of metals, and their property of reflecting light much better than any other substance, are necessary consequences of their opacity. This is also self-evident, because the fewer rays any body can transmit, the more it must reflect.

Lastly, the ductility of metals proceeds also from their density, from the disposition of their pores, and from the action of latent heat; for even the most brittle bodies, such as glass, sealing-wax, &c. become ductile by heat. The softness, fusibility, and volatility, of which all metals partake more or less, and which many of them possess in a superior degree, being properties entirely contrary to those of the earthy principle, probably proceed from the inflammable principle.

The order in which metals compared with each other possess most eminently their principal properties, is the same as that in which they are here enumerated, beginning always with that metal in which the property is most considerable.

1. *Specific gravity* or *density*. Platina, gold, mercury, lead, silver, copper, iron, and tin.

2. *Opacity*. We cannot well compare metals with each other in this respect, because it is so considerable in all, that it seems complete. If, however, they differ in this respect, the same order will serve for opacity as for density.

3. *Metallic lustre* or *brilliancy*. The same observation which was made concerning the last mentioned property is applicable to this also. We must, however, observe that as by polish bodies are rendered brighter, and that as whiteness contributes much to the reflexion of light, the whitest and hardest metals therefore reflect best. Hence, according to Mr Macquer, platina ought to be placed first; and then iron, or rather steel, silver, gold, copper, tin, lead.

Hardness of metals may contribute much to the duration of their polish; but certainly soft metals, if their texture be equally compact, are no less capable of receiving a polish than hard metals. Some hard metallic allays have been found to be less liable to tarnish than softer compounds, and have for this reason also been chiefly used for speculums. The property of reflecting light seems chiefly to depend on the closeness of the particles or on the density, on the smoothness of the surface, and on the colour being most similar to the colour of the light to be reflected. The white metals, silver, mercury, tin, reflect light more abundantly than others. Gold, being the densest metal next to platina, and perhaps because the colour of solar light has a slightly yellowish tinge, does also reflect light very copiously. Hence speculums made of leaf-gold have been found to be very powerful. Iron or steel reflects much less light than any of the above-mentioned metals, although Mr Macquer has considered it as capable of a greater reflective power. Platina is generally in so small grains, that its reflective power cannot easily be determined. The precise degrees of that power which ought to be assigned to each of the above-mentioned metals, cannot without accurate experiments be ascertained. Perhaps, however, their reflective powers will be found to be more nearly in the following order, than in that above mentioned from Mr Macquer. Silver, quicksilver, tin, gold, copper, iron, lead.

4. *Ductility*. Gold, silver, copper, iron, tin, lead. The ductility of mercury and that of platina are not yet determined.

5. *Hardness*. Iron, platina, copper, silver, gold, tin, and lead.

6. *Tenacity*. By tenacity we understand the force with which the integrant parts of metals resist their separation. This force appears to be in a compound ratio of their ductility and hardness. The comparative tenacity of metals is measured by the weight which wires of the same diameter, made of the several metals, can sustain without breaking. Gold is the most tenacious; then iron, copper, silver, tin, lead. The tenacity of mercury is unknown: that of platina is not yet determined, but is probably considerable.

7. *Fusibility*. Mercury, tin, lead, silver, gold, copper, iron, and lastly platina, which cannot be fused by the greatest fire of our furnaces, but only by the solar focus, or by a fire excited by dephlogisticated air.

Sect. II. *Of Mines and Ores in general.*

The substances found naturally combined with metals in the earth, are, particularly, sulphur and arsenic, sometimes separately, but generally conjointly. Metals combined with these substances are called *metals mineralised by sulphur*, or *by arsenic*, or *by sulphur and arsenic*; and these matters are called *mineralising* substances.

Besides the sulphur and arsenic with which metals are strictly combined in the mineral state, they are also pretty intimately combined with earthy substances, of different natures, and more or less divided.

These different matters united together form masses which are compact, heavy, brittle, and frequently possessed of much metallic lustre. These substances are properly called *ores*, or the matter of mines.

These ores are found in earths and stones of different kinds, as sands, flints, crystals, slates, indurated clays, according to the ground in which they are contained. But two kinds of stones in particular seem to accompany ores; and have therefore been considered by several mineralogists as matrixes in which metals are formed. One of these stones is a kind of crystal, generally white, milky, and semi-opaque, striking fire with steel, and of the class of vitrifiable earths. It is called QUARTZ.

The other stone is less hard, which does not strike fire with steel, and is sometimes milky like quartz; sometimes transparent and of different colours, consisting of rhomboidal crystals, which are composed of plates and faces. This stone becomes more soft and friable by being exposed to fire. It is called *spar*. Spar is more like to gypseous stones than to any other, but it differs from gypseous stones in possessing a much greater density. Some spars are so heavy, that they exceed in this respect all other stones. See SPAR.

These earthy and stony substances form the *matrix of the ore*.

Ores are natural compounds, containing metals allayed with different substances.

Excepting gold, and a very small quantity of each of the other metals found in some places so pure as to possess all their characteristic properties, nature exhibits to us metals and semimetals differently allayed not only with each other, but also with several heterogeneous substances, which so alter and disguise their qualities, that in this state they cannot serve for any of the purposes for which they are proper when they are sufficiently pure.

Ores consist, 1. Of metallic substances *calcined*; or, 2. Of these substances combined with other matters, with which they are said to be *mineralised*.

Calcined metallic substances, or *calciform ores*, are metallic substances deprived of phlogiston, and in the state of a calx or metallic earth. Such are all *ferruginous ochres*, which are calces of iron.

Mineralised ores, are, 1. *Simple*, containing only one metallic substance: or, 2. *Compound*, containing two or more metallic substances.

Of the simple, and also of the compound ores, four kinds may be distinguished.

1. Ores consisting of metallic substances mineralised by *sulphur*. Such is the lead-ore called *galena*, composed of lead and sulphur.

2. Ores consisting of metallic substances mineralised by *arsenic*. Such is the *white pyrites*, containing iron and arsenic.

3. Ores consisting of metallic substances mineralised *by sulphur and by arsenic*. Such is the *red silver-ore*, containing silver, arsenic, and sulphur.

4. Ores consisting of metallic substances mineralised by *saline matters*. Such are the *native vitriols*. Such also is probably the *corneous silver-ore*, which, according to Mr Cronstedt's opinion, is a luna cornea, or silver combined with marine acid. Of this kind of ores, or native metallic salts, is perhaps the *sedative salt of borax*, which from Mr Cadet's experiments, published in the Memoirs of the Royal Academy for the year 1766, is conjectured to be copper combined with marine acid, and which has been said to be found native. To this class also may be referred the *silver mineralised by an alkaline substance*, which Mr Von Justi pretends to have discovered.

Henckel, and after him Cramer, and the author of the Dictionary of Chemistry, pretend, that in mineralised ores, besides the above mentioned metallic and mineralising substances, are also contained a metallic and an unmetallic earth. But Wallerius affirms, that the existence of such earths cannot be shown, and that sulphur is incapable of dissolving unmetallic earths, and even the calces of all metallic substances, excepting those of lead, bismuth, and nickel.

Metals and *metalliferous ores* are found in various places.

I. *Under water*; in beds of rivers, lakes, and seas, and chiefly at the flexures of these: such are the auriferous and ferrugineous sands, grains of native gold, ochres, and fragments of ores washed from mines.

II. *Dissolved in water*: such are the vitriolic waters containing iron, copper, or zinc.

III. *Upon the surface of the earth*. Such are many ochres; metalliferous stones, sands, and clays; and lumps of ores Mr Gmelin says, that in the northern parts of Asia ores are almost always found upon or near the surface of the ground.

IV. *Under the surface of the earth*. When the quantity of these collected in one place is considerable, it is called a *mine*.

Subterranean metals and ores are differently disposed in different places.

1. Some are *infixed in stones and earths*, forming *nodules* or *spots* diversely coloured.

2. Some are equably and *uniformly diffused through the substance of earths and stones*, to which they give colour, density, and other properties. Such are the greatest part of those earths, stones, sands, clays, crystals, flints, gems, and fluors, which are coloured.

3. Some form *strata* in mountains. Such are the slates containing pyrites, copper-ore, lead-ore, silver-ore, or blend. These lie in the same direction as the strata of stones betwixt which they are placed; but they differ from the ordinary strata in this circumstance, that the thickness of different parts of the same metalliferous stratum is often very various; whereas the thickness of the stony strata is known to be generally very uniform.

4. *Fragments of ores* are frequently found accumulated in certain subterranean cavities, in fissures of mountains, or interposed betwixt the strata of the earth. These are loose, unconnected, frequently involved in clay, and not accreted to the contiguous rocks or strata immediately, nor by intervention of spar or of quartz, as the ores found in veins are. Tin and iron mines are frequently of the kind here described.

5. Large entire masses of ores are sometimes found in the stony strata of mountains. These are improperly called *cumulated veins*, because their length, relatively to their breadth and depth, is not considerable.

6. Some instances are mentioned of *entire mountains* consisting of ore. Such is the mountain Taberg in Smoland; and such are the mountains of Kerunavara and Luosavara in Lapland, the former of which is 1400 perches long and 100 perches broad. These mountains consist of iron-ore.

7. Lastly, and chiefly, metals and ores are found in oblong

Pyrites. oblong tracts, forming maffes called *veins*, which lie in the ftony ftrata compofing mountains. See the article MINE.

SECT. III. *Of the Pyrites.*

PYRITE is a mineral refembling the true ores of metals, in the fubftances of which it is compofed, in its colour or luftre, in its great weight, and, laftly, in the parts of the earth in which it is found, fince it almoft always accompanies ores. It is, like ores, compofed of metallic fubftances, mineralized by fulphur or by arfenic, or by both thefe matters, and of an unmetallic earth intimately united with its other principles.

Notwithftanding the conformity of pyrites with ores properly fo called, fome chemifts and metallurgifts diftinguifh the former from the latter minerals; becaufe the proportion and connection of the materials compofing the pyrites differ much from thofe of ores. Thus, although fometimes pyrites contains more metal than fome ores, yet generally it contains lefs metal, and a larger quantity of mineralifing fubftances, fulphur and arfenic, and particularly of unmetallic earth. The connection of thefe matters is alfo much ftronger in pyrites than in ores, and they are accordingly much harder; fo that almoft every pyrites can ftrike fparks from fteel.

From the above property of ftriking fparks from fteel, they have been called *pyrites;* which is a Greek word fignifying *fire-ftone*. Pyrites was formerly ufed for fire-arms, as we now ufe flints; hence it was called *carabine-ftone*. It is ftill named by fome *marcafite*. Perhaps no other kind of natural body has received fo many names. Perfons curious to know the other names lefs ufed than thofe we have mentioned, may find them in *Henckel's Pyritologia*. We think, with that celebrated chemift, that the fubject has been perplexed by this multiplicity of names; for before his great and excellent work, the notions concerning pyrites were very confufed and inaccurate.

Pyrite differs alfo from ores by its forms and pofitions in the earth. Although pyritous metals generally precede, accompany, and follow veins of ores; they do not, properly fpeaking, themfelves form the oblong and continued maffes called *veins*, as ores do; but they form maffes fometimes greater and fometimes fmaller, but always diftinct from each other. Large quantities of them are often found unaccompanied by ores. They are formed in clays, chalk, marles, marbles, plafters, alabafters, flates, fpars, quartz, granites, cryftals, in a word, in all earths and ftones. Many of them are alfo found in pit-coals and other bituminous matters.

Pyrites is alfo diftinguifhable from ores by its luftre and figure; which is almoft always regular and uniform, externally or internally, or both. Some ores indeed, like thofe of lead, many ores of filver, and fome others, have regular forms, and are in fome manner cryftallized; but this regularity of form is not fo univerfal and fo confpicuous in ores as in pyrites. The luftre of pyrites feems to be caufed by its hardnefs, and the regularity of its form by the quantity of mineralifing fubftances which it contains.

By all thefe marks we may eafily, and without analyfis, diftinguifh pyrites from true ores. When we fee a mineral that is heavy, poffeffed of metallic luftre, and of any regular form, the mafs of which appears evi- Of Pyrites. dently to be entire, that is, not to have been a fragment of another mafs, and which is fo hard as to be capable of ftriking fparks from fteel, we may be affured that fuch a mineral is a pyrites, and not an ore.

The clafs of pyrites is very numerous, various, and extenfive. They differ one from another in the nature and proportions of their component parts, in their forms, and in their colours. The forms of thefe minerals are exceedingly various. No folid, regular or irregular, can eafily be conceived, that is not perfectly imitated by fome kind of pyrites. They are fpherical, oval, cylindrical, pyramidal, prifmatical, cubic; they are folids with 5, 6, 7, 8, 9, 10, &c. fides. The furface of fome is angular, and confifts of many bafes of fmall pyramids; while their fubftance is compofed of thefe pyramids, the points of which all unite in the centre of the mafs.

Pyritous minerals differ alfo in their component fubftances. Some of them are called *fulphureous*, *martial*, *cupreous*, *arfenical*, as one or other of thefe fubftances predominate. We muft obferve with Henckel, whofe authority is very great in this fubject, that in general all pyrites are martial; as ferruginous earth is the effential and fundamental part of every pyrites. This earth is united with an unmetallic earth, with fulphur or arfenic, or with both thefe matters; in which cafe, the fulphur always predominates over the arfenic, as Henckel obferves. He confiders thefe as the only effential principles of pyrites; and believes that all the other matters, metallic or unmetallic, which are found in it, are only accidental; amongft which he even includes copper, although fo much of it exifts in fome kinds of pyrites, that thefe are treated as ores of copper, and fometimes contain even 50lb. of copper each quintal. Many other metals, even gold and filver, are fometimes combined in pyrites; but thefe are lefs frequent, and the precious metals always in very fmall quantities; they are therefore juftly to be confidered as accidental to pyrites. The different fubftances compofing pyrites fenfibly affect its colours. Henckel diftinguifhes them in general into three colours, white, yellowifh, or a pale yellow, and yellow. He informs us, that thefe three colours are often fo blended one with another, that they cannot be eafily diftinguifhed unlefs when compared together.

The white pyrites contain moft arfenic, and are fimilar to cobalt and other minerals abounding in arfenic. The Germans call them *mifpickle*, or *mifpilt*. Iron and arfenic form the greateft part of this pyrites. As arfenic has the property of whitening copper; fome pyritous minerals almoft white, like that of Chemnitz in Mifnia, are found to contain 40 pounds of copper per quintal, and which are fo much whitened by the arfenic, that they are very like white pyrites. But Henckel obferves, that thefe pyritous matters are very rare, and are never fo white as the true white pyrites, which is only ferruginous and arfenical.

Yellowifh pyrites is chiefly compofed of fulphur and iron. Very little copper and arfenic are mixed with any pyrites of this colour, and moft of them contain none of thefe two metallic fubftances. This is the moft common kind of pyrites: it is to be found almoft every where. Its forms are chiefly round, fpherical, oval, flattened, cylindrical; and it is compofed internally of needles

Of Pyrites. needles or radii, which unite in the centre, or in the axis of the solid.

Yellow pyrites receives its colour from the copper and sulphur which enter into its composition. Its colour, however, is inclined to a green; but is sufficiently yellow to distinguish it from the other two kinds of pyrites, particularly when they are compared together. To make this comparison well, the pyrites must be broken, and the internal surfaces must be placed near each other. The reason of this precaution is, that the colour of minerals is altered by exposure to the air.

Persons accustomed to these minerals can easily distinguish them. The chief difficulty is, to distinguish white pyrites from cobalt and other minerals; which also contain some copper and much arsenic.

Hence then we see, that arsenic is the cause of whiteness in pyrites, and is contained in every pyrites of that colour; that copper is the principal cause of the yellow colour of pyrites; and that every pyrites which is evidently yellow contains copper; that sulphur and iron produce a pale-yellow colour, which is also produced by copper and arsenic; hence some difficulty may arise in distinguishing pyrites by its colours. We may also observe, that sulphur and arsenic, without any other substance, form a yellow compound, as we see from the example of orpiment or yellow arsenic. Thus, although the colours of the pyrites enable us to distinguish its different kinds, and to know their nature at first sight, particularly when we have been accustomed to observe them; yet we cannot be entirely certain concerning the true nature of these minerals, and even of all minerals in general; that is, to know precisely the kinds and proportions of their component substances, but by chemical analysis and decomposition.

Besides the above-mentioned matters which compose pyrites, it also contains a considerable quantity of unmetallic earth; that is, an earth which cannot by any process be reduced to metal. Henckel, Cramer, and all those who have examined this matter, mention this earth, and prove its existence.

We ought to observe, that this earth is combined with the other principles of the pyrites, and not merely interposed betwixt its parts. It must therefore be distinguished from other earthy and stony matters mixed accidentally with pyrites, and which do not make a part of the pyrites, since they may be separated by mechanical means, and without decomposing that mineral: but the earth of which we now treat is intimately united with the other constituent parts of the pyrites, is even a constituent part of pyrites, and essential to the existence of this mineral, and cannot be separated but by a total decomposition of it.

According to Henckel, this unmetallic earth abounds much in the white pyrites, since he found from the analyses which he made, that the iron, which is the only metal existing in these pyrites, is only about $\frac{1}{70}$th part of the fixed substance that remains after the arsenic has been expelled by torrefaction or sublimation.

A much larger quantity of iron is in the pale-yellow pyrites, according to Henckel. The proportion of iron is generally about 12 pounds to a quintal of pyrites, and sometimes 50 or 60 pounds: this is therefore called *martial pyrites*. It contains about one-fourth of its weight of sulphur, and the rest is unmetallic earth.

The quantity of unmetallic earth contained in the yellow or cupreous pyrites, which are also martial, since, as we have observed, iron is an essential part of every pyrites, has not yet been determined. They probably contain some of that earth, though perhaps less of it than the others.

The nature of this unmetallic earth of pyrites has not been well examined. Henckel thinks that it is an earth disposed already by nature to metallisation, but not sufficiently elaborated to be considered as a metallic earth. This opinion is not improbable; but as alum may be obtained from many pyrites, may we not suspect that this unmetallic earth is of the nature of the basis of alum or argillaceous earth? Perhaps also this earth is different in different kinds of pyrites. The subject deserves to be well examined.

Although pyrites are not so valuable as true ores, because in general it contains less metal, and but exceedingly little of the precious metals; and because its metallic contents are so difficult to be extracted, that, excepting cupreous pyrites, which is called *pyritous copper ore*, it is not worked for the sake of the contained metal; yet it is applied to other purposes, and furnishes us with many useful substances; for from it we obtain all our green and blue vitriols, much sulphur, arsenic, and orpiment. *See the principal processes by which these substances are extracted from pyrites, under the* section SMELTING *of* ORES.

As all pyrites contain iron, and most of them contain also sulphur; as the pyrites most frequently found contains only these two substances with the unmetallic earth; and as iron and sulphur have a singular action upon each other when they are well mixed together and moistened; hence many kinds of pyrites, particularly those which contain only the principles now mentioned, sustain a singular alteration, and even a total decomposition, when exposed during a certain time to the combined action of air and water. The moisture gradually penetrates them, divides and attenuates their parts; the acid of the sulphur particularly attacks the martial earth, and also the unmetallic earth; its inflammable principle is separated from it, and is dissipated. While these alterations happen, the pyrites changes its nature. The acid of the sulphur which is decomposed, forms with the fixed principles of the pyrites, vitriolic, aluminous, and selenitic salts; so that a pyrites, which was once a shining, compact, very hard mineral, becomes in a certain time a greyish, saline, powdery mass, the taste of which is saline, austere, and styptic.

Lastly, if this mass be lixiviated with water, crystals of vitriol, and sometimes of alum, according to the nature of the pyrites employed, may be obtained by evaporation and crystallization.

This alteration and spontaneous decomposition of pyrites, is called *efflorescence* and *vitriolization;* because the pyrites become covered with a saline powder, and because vitriol is always formed. This vitriolization is more or less quickly accomplished in pyrites according to its nature. It is a kind of fermentation excited by moisture amongst the constituent parts of these minerals; and it is so violent in those which are most disposed

Pyrites. posed to it, that is, in the pale yellow pyrites, which contain chiefly sulphur and iron, that when the quantity of these is considerable, not only a sulphureous vapour and heat may be perceived, but also the whole kindles and burns intensely. The same phenomena are observable, and the same results are formed, by mixing well together, and moistening a large quantity of filings of iron and powdered sulphur; which experiment Lemeri has made, to explain the causes of subterranean fires and volcanoes.

We cannot doubt that, as the earth contains very large masses of pyrites of this kind, they must undergo the same changes when air and moisture penetrate the cavities containing them; and the best natural philosophers agree, that very probably this surprising decomposition of pyrites is the cause of subterranean fires, of volcanoes, and of mineral waters, vitriolic, aluminous, sulphureous, hot and cold.

No other pyrites is subject to this spontaneous decomposition when exposed to humid air, but that which is both martial and sulphureous; that is, the pale-yellow pyrites. The arsenical pyrites, or that which contains little or no sulphur, is not changed by exposure to air. This latter kind is harder, heavier, and more compact, than the former. The pyrites which is angular and regularly shaped, is chiefly of this kind. Mr Wallerius, in his Mineralogy, proposes to distinguish this kind of pyrites by the name of *marcasite*. When cut, it may be polished so well as to give a lustre almost equal to that of diamonds, but without refracting or decomposing the light; for it is perfectly opaque. It has been employed some years past in the manufacture of toys, as of buckles, necklaces, &c. and is called in commerce *marcasite*.

We cannot, however, concur with Mr Macquer (from whom the above is taken), in thinking that there is sufficient reason for considering the minerals called *pyrites*, as a distinct class of substances from ores. They have indeed no mark by which they can certainly and constantly be distinguished from these. The hardness or property of striking ignited sparks from steel is not common to all the substances generally called *pyrites*; for we find some of these enumerated by mineralogists which have not that property. Wallerius even mentions a pyrites which contains no iron, altho' that metal is thought by Henckel to be essential to pyrites. The distinction of pyrites from ores has been chiefly introduced by miners; because the greatest part of the former minerals contain so little metal, and so much of the mineralising substances, sulphur, or arsenic, that they are seldom smelted. Nevertheless, some kinds of pyrites are found which contain so much copper, that they are smelted with great profit. Accordingly, some later mineralogists consider the cupreous yellow pyrites as an ore of copper, the pale-yellow martial pyrites as an ore of iron; and the white arsenical pyrites as an ore of arsenic. See *Ores* of *Copper*, *Iron*, and of *Arsenic*, below.

Sect. IV. *Essaying of Ores in general.*

Essays are chemical operations made in small, to determine the quantity of metal or other matter which is contained in minerals; or to discover the value or purity of any mass of gold or silver. The former kind is the subject of the present section; the latter is treated under the word Essays, in the order of the alphabet.

Essaying of Ores.

Before essays of ores can be well made, a preliminary knowledge of the nature of the several metallic minerals ought to be attained. Each metal has its proper and improper ores, which have peculiar characters and appearances: hence persons accustomed to see them, know pretty nearly by the appearance, weight, and other obvious qualities, what metal is contained in a mineral. A good essayer ought to be very intelligent in this matter, that he may at once know what the proper operations are which are requisite to the essay of any given mineral.

As metals are very unequally distributed in their ores, we should be apt to make false and deceitful essays, if we did not use all possible precautions that the proportionable quantity of metal produced by an essay shall be nearly the medium contained in the whole ore. This is effected by taking pieces of the mineral from the several veins of the mine if there be several, or from different places of the same vein. All these minerals are to be shaken together with their matrixes. The whole is to be well mixed together, and a convenient quantity of this mixture is to be taken for the essay. This is called the *lotting* of the ore.

As essays, particularly the first, are generally made in small, essayers have very small weights corresponding to the weights used in the great; that is, to the quintal or hundred pounds weight, to pounds, ounces, drams, &c. The essay quintal and its subdivisions vary according to the difference of weights in different countries; and this occasions some confusion when these weights are to be adjusted to each other. Tables of these weights are found in treatises of essaying; and particularly in that written by Schlutter, and translated and rendered more complete by Hellot, which contains all the details necessary for the subject.

The custom is to take, for the essay quintal, a real weight of a gros, or dram, which in France is equal to 72 grains; but as the whole dram represents 100 pounds, each grain represents a pound and a fraction of a pound; and hence some difficulty and confusion arise in making the subdivisions. A better method is that of Mr Hellot, which is to make the fictitious or essay quintal equal to 100 real grains, and then each grain represents a real pound. This essay quintal is sufficiently exact for ores of lead, tin, copper, iron, antimony, bismuth, and mercury. But for ores of silver and gold, another representation is convenient: for these metals, as Mr Hellot says, are generally in so small quantity, that the button or small piece of metal obtained in the essay could not be accurately weighed if 100 real grains were made to represent a quintal; and the difficulty of separating the gold from so small a quantity would be still greater. These motives have induced Mr Hellot to use for these ores a fictitious quintal 16 times bigger; that is, equal to 1600 real grains, which represent 1600 ounces; that is, 100 lb. or quintal. The ounce being represented by a grain, its several subdivisions must be represented by fractions of

Essaying of Ores.

† The pounds, of which 100 are here supposed to make a quintal, are called *Paris pounds*, one of which contains 1260 Troy grains.

of a grain. Thus 12 grains of the fictitious quintal correspond with $\frac{5}{28}$ of a real grain (B); and this latter quantity may be accurately weighed in essay-balances: which when well made are sensible to a much less weight. See *(Essay)*-BALANCE.

When a quintal of an ore to be essayed has been weighed, and lotted, as we described above, it is to be roasted in a test under a muffle. It is to be washed, if necessary; and, in short, the same operations are to be made in small which are usually done in great. Additions also are to be made, and in proper proportions, according to the peculiar nature of the ore. The fluxes generally mixed with the essays in ore are three, four, or five parts of black flux; one, two, or three parts of calcined borax; and one half of that quantity of decrepitated common salt. The more refractory the ore is, the more necessary is the addition of these fluxes: then the whole mixture is to be fused either in a forge or in a melting or essay furnace.

To make essays well, all possible attention and accuracy are to be employed. This object cannot be too much attended to; for the least inaccuracy in weighing, or loss of the smallest quantity of matter, might cause errors, so much greater as the disproportion betwixt the weights employed and those represented is greater. The most minute accuracy therefore is necessary in these operations. For instance, the essay-balances ought to be small, and exceedingly just. The ore ought not to be weighed till it has been reduced to gross powder fit for roasting; because some of it is always lost in this pulverization. When the ore is roasted, it ought to be covered with an inverted test; because most ores are apt to crackle and disperse when first heated. To make the fusion good and complete, the precise degree of fire which is requisite ought to be employed; and when it is finished, the crucible ought to be struck two or three times with some instrument, to facilitate the disengagement of the parts of the regulus from the scoria, and to occasion their descent and union into one button of metal. The crucible ought not to be broken, nor its contents examined, till it is perfectly cold.

Upon breaking the crucible, we may know that the fusion has been good, if the scoria be neat, compact, and equal; if it has not overflowed or penetrated the crucible; if it contain no metallic grains; and if its surface be smooth, and hollowed in the middle. The regulus or button ought to be well collected, without holes or bubbles, and to have a neat convex surface; it is then to be separated from the scoria, well scraped and cleaned; and, lastly, is to be weighed. If the operation has been well made, its weight shows the quantity of metal which every real quintal of ore will yield in the great. If the perfect success of this essay be in any respect doubtful, it ought to be repeated; but the best method at all times is, to make several essays of the same ore. Some small differences are always found, however well the essays may have been made. By taking the medium of the results of the several operations, we may approach as nearly as possible the true product of the ore.

Lastly, as mines are not worked, nor founderies established (which cannot be done without considerable expence), till the ore has been essayed, 10 or 12 real pounds of the ore ought to be previously essayed; and essayers ought to be furnished with necessary furnaces and instruments for these larger essays.

In Part II. to the several articles of the ores of metals, we shall add the most approved methods of essaying these ores. We shall here only further observe in general, that the methods commonly practised for essaying ores of imperfect metals, and semimetals especially, are insufficient to procure the whole quantity of metal contained in ores, or even so much as is obtained in the smelting of large quantities of ores; and that therefore the result of essays is not to be considered as the precise quantity contained in an ore, but generally only as an inaccurate approximation to that quantity. M. Gellert ascribes one cause of the want of success of these operations to the alkaline salts employed as fluxes to the ores, by which most metallic calces are partially soluble, but more especially so when any of the sulphur of the ore remains; which, by uniting with these salts, forms a hepar of sulphur which is the most powerful of all solvents. He proposes therefore to omit the black flux, and other alkaline salts, and to add nothing to the ore but powder of charcoal and some fusible glass. This method, he says, he learned from Mr Cramer, and has himself used with much success in the essays of iron and copper: but finding that other imperfect metallic substances could not sustain the heat necessary to effect the fusion and vitrification of the unmetallic parts of the ore without being partly dissipated, he found it necessary to add in the essays of these latter metallic matters some borax, by which the fusion might be completed with less heat. As we consider this as a considerable improvement in the art of essaying ores, we shall, to the articles of the several ores, add not only the processes commonly prescribed, but all those of Mr Gellert, according to the method here mentioned.

PART II.

Containing a summary Description of the principal ORES of each METAL, and the Methods of Essaying them.

SECT. I. *Ores of Gold.*

§ 1. PROPERLY speaking, no ores of gold exist: for as this metal cannot be allayed with arsenic, nor with sulphur, it is never found directly mineralised by these substances, as the other metals are. In the second place, if it be mineralised indirectly by the union it contracts with other metals naturally combined with sulphur and arsenic, so small a quantity of it only is found in these ores, that they

Ores of Gold

they scarcely even deserve the name of *improper ores of gold*.

Hence gold is found either in its natural state, of a certain degree of purity, possessed of all its properties; or engaged with some other metals in certain minerals.

The gold which is found alone is called *native* or *virgin gold*. This is generally incrusted, and fixed in different kinds of stones, principally in flints and quartz. Mr Cramer says, that the yellow brilliant spots of the blue stone called *lapis lazuli*, are native gold; but these are very small.

Gold is also found in fat and muddy earths; and Mr Cramer affirms, that scarcely any sand can be found which does not contain gold; but he acknowledges, at the same time, that the quantity is too small to compensate for the expence of obtaining it.

Lastly, the largest quantity of native gold is to be found in the sands of some rivers. It is chiefly collected in hollows at the bottom of these rivers, and at their several bendings. The gold is collected in these places by a natural operation, similar to that of washing of ores.

A considerable quantity of gold is in the sands of several rivers in France: so that persons who collect it find enough to compensate their trouble. Mr Reaumur, in a memoir that he gave in the year 1718 concerning the rivers of France which contain gold, enumerates ten of them; namely, the Rhine, the Rhone, the Doux, the Ceze, and the Gardon; the Arriege; the Garonne; two streams which flow into the Arriege, called *Ferriet* and *Benagues*; lastly, the Salat, the source of which is in the Pyrenean mountains.

The Ceze is the river which furnishes the largest quaintity of gold at certain times. Mr Reaumur observes, that its particles are larger than those of the Rhine and of the Rhone; and says, that in some days a peasant will find gold to the value of a pistole, and in others will scarcely find any.

The native gold found in rivers or elsewhere is never perfectly pure, or of 24 karats. It always contains a certain quantity of allay, which is generally silver. The gold of the French rivers, according to Mr Reaumur's trials, was found to be from 18 to 22 karats, that of the Ceze being the lowest, and that of the Arriege being the purest.

Although gold, however, as above observed from Macquer, cannot be directly dissolved by sulphur, yet it probably may be mineralised by the intervention of other metallic matters. Thus, although no proper ore of gold exists, yet it is found in several mineral substances, in which it is always accompanied, as Cramer affirms, with a much larger quantity of silver; to which latter metal that author attributes its mineralised state. The minerals containing gold are blend, cupreous and arsenical pyrites, ore of antimony, cinnabar, white ore of arsenic, vitreous and other silver ores, and the lead-ore called *galena*.

Gold is more frequently imbedded in quartz than in any other matrix, but it is also found in limestone and in hornblend. Gold mines are in general very precarious, as they do not form regular veins, nor is the gold uniformly distributed through a matrix.

Essaying of Ores of Gold.

Becher and Cramer think, that no sand is entirely free from gold. The yellow, red, black, and violet-coloured ferruginous sands, are said to contain most gold. Mr Hellot relates, that in 11 essays of one kind of sand, from a quintal, or 921,600 grains, were obtained each time from 848 to 844 grains of noble metal, exclusive of the gold which remained in the scoria; and that of the metal thus obtained two thirds were gold, and the remaining third was silver. He says, that parcels of sand taken up at very small distances from each other contained very unequal proportions of gold.

The gold found in sands is generally less pure than that which is imbedded in a solid matrix. Reaumur says, that a piece of gold, weighing 448 ounces, was shown to the Royal Academy at Paris, which was found upon essay to have different fineness in different parts of the mass.

§ 2. *Ores and earths containing gold may be essayed* by the methods directed for the extraction of gold from large quantities of these auriferous matters, (see Part III.): or they may in general be essayed by being fused in a cupel or test, placed under the muffle of an essay-furnace, or in a crucible placed in an air furnace, with eight or ten times their quantity of lead if they be easily fusible, and with a larger quantity of lead if they be difficultly fusible; and by scorifying the earthy matters, while the lead becomes impregnated with the noble metals. These operations are entirely similar to those employed for the separation of silver from its ores by precipitation with lead; *a detail of which see subjoined under the section* Ores *of* Silver, [*Processes* I. III. IV. V. VI.]. These metals are afterwards to be separated from the lead by cupellation, in the manner directed in the article Essay (*of the value of silver and of gold*). The gold is then to be separated from the silver by the processes described in the article Parting.

The quantity of lead to be added to the ore in this essay must be such as renders the scoria very thin, that the whole gold may be imbibed by the lead. Some iron ores containing gold cannot be reduced into a scoria sufficiently thin with 16 times their quantity of lead, unless the heat be at the same time considerably increased. When the ore is exceedingly refractory, the scorification ought to be promoted by adding to it four times its quantity of tartar, twice its quantity of nitre, and four times its quantity of litharge. This mixture is to be put into a good essay-crucible, and covered with the sea-salt. The crucible is to be set in a forge-hearth, and exposed gradually to heat, till the scoria has acquired sufficient fluidity, and the lead has imbibed the noble metal.

See the methods which have been used for essaying auriferous sands, under Part III.

Sect. II. *Ores of Platina.*

Platina is very rare, and has been but lately discovered. As, like gold, it cannot be allayed with sulphur or with arsenic, probably no *ore*, properly so called, exists of this metal. Accordingly in the only mines of platina which we know, namely, the gold mines of Santafe near Carthagena, the platina is found native like the gold, and in its metallic state.

Ores of Silver.

Sect. III. *Ores of Silver.*

§ 1. Next to gold, ſilver is the metal moſt frequently found in its metallic ſtate, that is, not mineraliſed by ſulphur or by arſenic. This ſilver, called alſo *native* or *virgin*, generally affects ſome regular form, and conſiſts of filaments or vegetations of various figures. It is found in form of plates, of fibres, or of grains, or cryſtallized. It lies generally in quartz, flint, ſpar, ſlate, cobalt, and in ſilver-ores. It is ſometimes enveloped in a thin ſtony cruſt. It is generally allayed with ſome gold: but ſilver, like all the other metals, is much more frequently found mineraliſed by ſulphur and by arſenic.

Three principal proper ores of ſilver are known, which are very rich, but very rare. Theſe are:

1. The *vitreous ſilver ore.* This ore has no determinate figure, and has nearly the colour, ſoftneſs, and fuſibility of lead. It is very heavy, and contains three quarters of its weight of pure ſilver. In this ore the ſilver is mineraliſed by ſulphur alone. Some expert artiſts imitate it very well by combining ſulphur with ſilver by fuſion in a crucible.

This ore, according to Cronſtedt, is either in form of plates or of fibres, or is cryſtallized, or has no determinate figure. It may be imitated by adding about five parts of ſulphur to one part of melted ſilver; in which operation moſt of the ſulphur is conſumed; or it may be imitated by expoſing a plate of ſilver red-hot to the fumes of burning ſulphur.

2. The *horny* or *corneous ſilver ore.* This ore is ſo called from its colour and ſemitranſparency, by which it reſembles horn or colophony. When ſuddenly heated, it crackles, as almoſt all ores do, and melts with a gentle heat. Two-thirds of it are ſilver, which is mineraliſed by ſulphur and arſenic. This ore is very rare. Wallerius ſays, after Woodward, that it is found at Johann-Georgen-Stadt in Saxony.

Corneous ore has various colours; white, pearly, brown, yellow, greeniſh, or reddiſh. It is foliated and ſemitranſparent. It is ſomewhat ductile, and fuſible with the flame of a candle. When heated, it emits, as Wallerius ſays, a ſulphureous and blue flame, and, according to Cramer, alſo a very ſmall quantity of an arſenical fume. Wallerius ſays, that it contains two-thirds of ſilver, with a conſiderable quantity of ſulphur, and a ſmall quantity of arſenic. Lehman thinks that it is ſilver united with a little arſenic. But Mr Cronſtedt ſays, that it is a luna cornea, or ſilver combined with marine acid; and that it is incapable of being decompoſed but by ſubſtances which can unite with that acid. This latter opinion ſeems to be the moſt probable; as the ore, according to its deſcription, is ſimilar to luna cornea, and as it cannot be imitated by any mixture of ſulphur and of arſenic with ſilver. The blue flame, and the ſmell ſlightly arſenical, which are emitted from heated corneous ore, are alſo obſervable from every combination of marine acid with a ſubſtance containing phlogiſton.

3. *Red ſilver ore*, called alſo *roſiclare*. Its colour is more or leſs red; it is ſometimes cryſtallized, very heavy, and is fuſible like the above-mentioned ores. In this ore the ſilver is mineraliſed by arſenic and by ſulphur, but chiefly by the former. It alſo contains a little iron, and furniſhes two-thirds of its weight of ſilver. Its red colour may proceed either from the iron it contains; or from the mixture of arſenic and ſulphur; or, laſtly, from the particular manner in which the arſenic is united with the ſilver, an example of which we have in the red precipitate of ſilver made by the neutral arſenical ſalt.

Red ſilver ore is either plated or ſolid, or cryſtallized, and frequently ſemitranſparent. Its colour is various, from a dark grey to a deep red, according to the proportions of the two mineraliſing ſubſtances. It crackles and breaks in the fire, exhales an arſenical fume, and is readily fuſed. It is found generally in quartz, ſpar, cryſtal, hornblend.

Beſides the three ſilver ores above deſcribed, the following ores contain ſilver mixed with other metals.

1. *Grey ſilver ore.* This contains copper and ſilver mineraliſed by arſenic and ſulphur, and generally more of the former than of the latter metal; but as it is valued chiefly for the ſilver, it has been generally enumerated amongſt ſilver ores.

2. *White ſilver ore* is an arſenical pyrites containing ſilver.

3. *Black ſilver ore* contains ſulphur, arſenic, copper, iron, ſometimes lead, and about a fourth part of ſilver, according to Wallerius.

4. *Plumoſe ſilver ore* is white or black, ſtriated like plumb-alum, or like ore of antimony. It is ſilver mineraliſed by ſulphur, arſenic, and antimony.

5. *Pech-blend.* In this blend ſilver, gold, and zinc, are mineraliſed by ſulphur, probably by intervention of iron, by which the gold and zinc are rendered capable of uniting with the ſulphur.

6. Silver is frequently found in *galena*; and ſometimes in *martial pyrites*; in the *red ore of arſenic*; in various *ores of copper, lead, tin, iron*, and eſpecially *cobalt*; in *blends*; in *yellow* or *red earths*; in *black* and *blue baſaltes*; and alſo in *ſtrata of ſtones* which do not appear externally to contain any mineral ſubſtance.

7. *Liquid ſilver ore* or *guhr of ſilver*, is a grey or whitiſh liquid maſs, which contains, as Wallerius ſays, either native ſilver, or ſome fluid ſubſtance capable of producing it. Mr Cronſtedt mentions, in the Swediſh Memoirs, a water flowing through a mine in Norway containing ſilver. Another inſtance is alſo mentioned of a ſilver guhr, in the *Act. Erud. Upſal.* 1720.

8. Mr Von Juſti pretends, that he has found ſilver mineraliſed by an *alkaline ſubſtance*; but he has not ſpoken ſufficiently diſtinctly concerning it, to know whether he means a ſaline or earthy alkaline matter. Henckel alſo pretends, that by treating calcareous earth or certain clays with pyrites, ſilver may be obtained.

§ 2. *Ores of ſilver may be eſſayed* by the ſame methods which are employed for the extraction of that metal from large quantities of ores; which methods are different, and ſuited to the different qualities of the different ores. See Part III. Or, in general, ores and earths containing ſilver may be eſſayed by the following proceſſes, which are copied from Dr Mortimer's English

Essaying of Ores of Silver.

English edition of *Cramer's Art of Essaying Metals, Part II. Process* 1.

PROCESS I.

To precipitate Silver by means of Lead from fusible Ores.

"Pound the ore in a very clean iron mortar into fine powder: of this weigh one docimastical centner or quintal, and eight of the like centners of granulated lead.

"Then have at hand the docimastical test, which must not as yet have served to any operation: pour into it about half of the granulated lead, and spread it with your finger through the cavity of it.

"Put upon this lead the pounded ore; and then cover it quite with the remainder of the granulated lead.

"Put the test thus loaded under the muffle of an essay-furnace, and in the hinder part of it: then make your fire, and encreafe it gradually. If you look thro' the holes of either of the sliders, you will soon see that the pounded ore will be raised out of the melted lead, and swim upon it. A little after, it will grow clammy, melt, and be thrown towards the border of the test: then the surface of the lead will appear in the middle of the test like a bright disc, and you will see it smoke and boil: so soon as you see this, it will be proper to diminish the fire a small matter for a quarter of an hour; so that the boiling of the lead may almost cease. Then again, increase the fire to such a degree, that all may turn into a thin fluid, and the lead may be seen, as before, smoking and boiling with great violence. The surface of it will then diminish by degrees, and be covered over with a mass of scorias. Finally, have at hand an iron hook ready heated, wherewith the whole mass must be stirred, especially towards the border; that in case any small parcels of the ore not yet dissolved should be adherent there, they may be brought down, taking great care not to stir any the least thing out of the test.

"Now, if what is adherent to the hook during the stirring, when you raise it above the test, melts quickly again, and the extremity of the hook grown cold is covered with a thin, smooth, shining crust; it is a sign that the scorification is perfect; and it will be the more so as the said crust adherent to the hook shall be coloured equally on every side: but in case, while the scorias are stirred, you perceive any considerable clamminess in them, and when they adhere in good quantity to the hook, though red-hot, and are inequally tinged, and seem dusty or rough with grains interspersed here and there; it is a sign that the ore is not entirely turned into scorias. In this case, you must with a hammer strike off what is adherent to the hook, pulverize it, and with a laddle put it again into the test, without any loss or mixture of any foreign body, and continue the fire in the same degree till the scoria has acquired its perfection and the above-mentioned qualities. This once obtained, take the test with a pair of tongs out of the fire, and pour the lead, together with the scoria swimming upon it, into a cone made hot and rubbed with tallow. Thus will the first operation of the process be performed, which does not commonly indeed last above three quarters of an hour.

"With a hammer strike the scorias off from the regulus grown cold, and again examine whether they have the characteristics of a perfect scorification; if they have, you may thence conclude, that the silver has been precipitated out of the ore turned to scorias, and received by the lead.

"When the scorification lasts longer than we mentioned, the lead at last turns to scorias or litharge, and the silver remains at the bottom of the vessel: but the fire must be moderately supplied, and the vessels be extremely good, to produce this effect; for they seldom resist to the strength of the scorias long enough; so that the whole scorification may be brought to an end; which has afterwards this inconveniency, that the silver is dissipated by grains in the small hollows of the corroded ore, and can hardly be well collected again, when the ore has but little silver in it. Nay, there is still more time to be consumed to obtain the perfect destruction of the lead, by means of the combined actions of the fire and air, because the scorias swimming at the top retard it considerably.

"In this process, the sulphur and the arsenic of the silver-ore, when the ore is broken small, and extended widely in a small quantity, are in part easily dissipated by the fire, and in part absorbed by the lead; the lighter part of which, swimming upon the heavier, becomes very clammy by means of the sulphur which is in the ore; but when this is dissipated by the violence of fire, it turns into glass or scorias: but when arsenic is predominant in the ore, the plumbeous part turns immediately into a very penetrating and very fusible glass, having a dissolving efficacy, unless the arsenic lies hidden in a white pyrites or cobalt. For this reason, the fixed part of the ore, which is no silver, is dissolved by that glass, melts, and assumes the form of scorias. The unmetallic earths and the pure copper or lead ores thereto adherent are of this kind. The silver then remains immutable; and being freed of these heterogeneous bodies, which are partly dissipated and partly melted, it is precipitated and received by the remaining regulus of lead. Therefore this process is completed by three distinct operations; viz. 1. By roasting. 2. By scorification. 3. By the melting precipitation of the silver, which is the result of the two former operations.

"The ore must be pulverised very fine, in order to increase the surface, that the dissipation of the volatiles and the dissolution by litharge may be sooner effected. This pulverising must then be done before the ore is weighed, because there is always some part of the ore adherent to the mortar or iron plate on which it is made fine; which part being lost, the operation is not exact. Erker was in the right when he prescribed eight centners of lead for the subduing of fusible ores. Nevertheless, it must be owned, that this quantity is superfluous in some cases. However, as the fluxibility of the silver-ore depends upon the absence of stones, pyrites, &c. it is easy to see, that there are an infinite number of degrees of fluxibility which it would be needless to determine exactly, and most commonly very difficult to determine by the bare sight. Besides, a little more lead does not render the process imperfect; on the contrary, if you use too small fmall a quantity of lead, the fcorification is never completely made. Nay, there are a great many ores, containing fulphur and arfenic in plenty, that deftroy a confiderable quantity of lead: fuch are the red filver-ore, and that wherein there is a great deal of the fteel-grained lead-ore. If the fire muft be fometimes diminifhed in the middle of the procefs, it is in order to hinder the too much attenuated litharge, which is continually generated out of the lead, from penetrating the pores of the teft, and from corroding it; which is eafily done when the fire is over-ftrong; for then the furface of the veffel which is contiguous to the lead contracts cavities, or, being totally confumed by fmall holes, lets the regulus flow out of it. The veffels that are moft fubject to this inconvenience are thofe in the materials of which lime, plafter, and chalk are mixed. Nay, thefe bodies, which are in their nature refractory, being eroded during their fcorification, at the fame time communicate a great clamminefs to the fcoria; fo that a great quantity of the mafs remains adherent to the teft, in the form of protuberances, when you pour it out; whereby a great many grains of the regulus are detained."

PROCESS II.

The regulus obtained by the procefs I. contains all the filver of the ore, and the unfcorified part of the lead. The filver may be afterwards feparated from the lead, and obtained pure by *cupellation;* which procefs is defcribed under the article Essay *(of the value of Silver.)*

PROCESS III.

If the filver-ore cannot be wafhed clean, or if it be rendered refractory by a mixture of unmetallic earths and ftones, the fcorification of thefe earthy matters frequently cannot be completed by the procefs I. Cramer therefore directs, that fuch ores fhall be treated in the following manner.

"Bruife the ore into an impalpable powder, by grinding in a mortar; to a docimaftical centner of it add a like quantity of glafs of lead finely pulverifed; for the more exactly thefe two are mixed together, the more eafily the fcorification afterwards fucceeds. Put this mixture, together with 12 centners of lead, into the teft, according to procefs I. then put the teft under the muffle.

"Make firft under it a ftrong fire, till the lead boils very well; when you fee it fo, diminifh the violence of the heat, as was directed in the firft procefs; but keep it thus diminifhed a little longer: then, finally, again increafe the fire to fuch a degree, till you perceive the figns of a perfect fcorification and fufion. *See the whole procefs I.* Now this procefs lafts a little longer than the foregoing, and requires a greater fire towards the end.

"It fometimes happens that a very refractory ore cannot be diffolved by litharge; and that a mafs, which has the clamminefs of pitch, fwims upon the regulus and upon the fcorias themfelves which are already fubdued in part: when you fee this, fhut the vents of the furnace to diminifh the fire; then gently touch this refractory body with a fmall iron cold hook, to which it will immediately ftick; take it off foftly, not to lofe any thing; pound it into a fine powder, adding a little glafs of lead, and put it again into the teft; then continue the fcorification till it is brought to its perfection. But you muft always examine the fcoria of your refractory ore, to fee whether there may not be fome grains of regulus difperfed in it: for fometimes the fcorias that grow clammy retain fomething of the metal; which if you fufpect, pound the fcorias into a fine duft, and thus the grains of metal will appear if there are any left, becaufe they can never be pounded fine. The filver is feparated from this regulus by cupelling, as in Procefs II.

"All earths and ftones are refractory in the fire: for although fome of them melt naturally in the fire, as thofe that are vitrifiable do; neverthelefs all the others, a very few excepted, melt much more difficultly than metals, and never become fo thin in the fufion as is required for the fufficient precipitation of a precious metal. But litharge itfelf does not conveniently diffolve thefe refractory matters by the help of fire alone, unlefs you add fome mechanical mixture to them; for the very moment the faid litharge penetrates through the interftices of the refractory ore, and begins to diffolve it, a tenacious mafs is produced, which hardly admits any farther dilution by the litharge. You may fee it plain, if you make coloured glaffes with metallic calces: if you pour carelefsly upon them a calx that gives a colour, you will never obtain that they may be equally dyed on every fide, even although you fhould torture them for whole days together in a great fire. Nay, glafs already made can never be diluted by only pouring falts and litharge upon it. Wherefore, you muft ufe the artifice of glafs-makers, who, in the making of the moft perfect glaffes, take great care, before they put the fpecies of their ingredients into the fire, to have a mechanical mixture precede, or at leaft accede, during the fufion itfelf, which is done here by pounding glafs of lead mixed with the ore: but if you think that your glafs of lead is not fufficiently fufible, you may add to it litharge melted firft, and then pounded into a fine powder.

"As this fcorification requires a longer and a greater fire than the foregoing, and as a greater quantity of litharge is moreover requifite to fubdue the refractory fcoria; it is eafy to fee why a much greater quantity of lead muft be ufed here than in Procefs I.; and, although lefs lead is often fufficient, it is neverthelefs proper always to ufe the greateft quantity that can be neceffary; left, for inftance, it fhould be neceffary to try fo many times the lead alone, to make it evident how much filver the lead when alone leaves in the coppel. Nor need you fear left any thing of the filver be taken away by the lead, provided the coppels be good, and the coppelling duly put in execution: for you can hardly collect a ponderable quantity of filver out of the collected fume of the lead, which rifes during the coppelling, as well as out of the litharge that is withdrawn into the coppel."

PROCESS IV.

If the ore be rendered refractory by pyrites, Cramer directs that the filver fhould be precipitated by lead in the following manner. *(Art of Affaying,* Part II. proc. 4.)

"Break

Essaying of Ores of Silver.

"Break your ore into a rough powder, and put a centner of it into the test: put upon this another test in the manner of a tile; put it under the muffle hardly red-hot: increase the fire by degrees. There will always be a crackling: which being ended, take away the upper-test; for when the vessels have been red-hot about one minute, the ore ceases to split. Leave the ore under the muffle till the arsenic and the sulphur are for the most part evaporated; which you will know from the cessation of the visible smoke, of the smell of garlic, or the acid; then take away the test, and leave it in a place not too cold, that it may cool of itself.

"Pour out, without any dissipation, the roasted ore, and with a knife take away what is adherent to the vessel; pound it to a most subtile powder, and grind it together with an equal weight of glass of lead; and, finally, scorify the whole collected ore in the same test wherein the testing was made, unless it has contracted chinks, as was described in Process III.

"*Remarks.* "Yellow pyrites-ores contain a very great quantity of sulphur, even greater than is necessary to saturate the metal that lies hidden in them.—For which reason this superfluous sulphur dissipates in a middling fire; but if it had been mixed with lead, it would have rendered it refractory, nor could it afterwards be dissipated from it without a considerable destruction of the lead. The white arsenical pyrites turn also a great quantity of lead into glass, on account of the abundance of the arsenic they contain. For which reason these ores must be previously roasted, that the sulphur and arsenic may be dissipated. Nor need you fear lest any part of the silver be carried away with the arsenic; for when arsenic is separated from any fixed body, by a certain degree of fire, it carries nothing of that body away with it."

PROCESS V.

Silver may be precipitated from its ore by cupellation only, in the following Process, given by Cramer. [*Art of Assaying, Part* II. *Proc.* 9.]

"Pound one centner of ore; roast it in the manner directed in the last process; beat it to a most subtle powder; and if it melts with difficulty on the fire, grind it together with one centner of litharge, which is not necessary when the ore melts easily: then divide the mixture or the powder of the ore alone into five or six parts, and wrap up every one of them severally in such bits of paper as can contain no more than this small portion.

"Put a very large coppel under the muffle; roast it well first, and then put into it sixteen centners of lead: when the lead begins to smoke and boil, put upon it one of the said portions with the small paper it was wrapt up in, and diminish the fire immediately, in the same manner as if you would make a scorification in a test, but in a lesser time. The small paper, which turns presently to ashes, goes of off itself, and does not sensibly increase the mass of the scorias. The ore proceeding therefrom is cast on the border, and turns to scorias very soon. Increase the fire again immediately, and, at the same time, put another portion of the ore into the coppel, as was just now said. The same effects will be produced. Go on in the same manner, till all the portions are thrown in and consumed in the lead. Finally, destroy the remaining lead with a stronger fire.

"The silver that was in the ore and in the lead will remain in the coppel. If you deduct from it the bead proceeding from the lead, you will have the weight of the silver contained in the ore. If the ore employed was easy to be melted, all the scoria vanishes; but if it was refractory or not fusible, all the scoria does not always go away, but there remains something of it now and then in the form of dust. A great many ores and metals may be tried in this way, except only such as split and corrode the coppels.—There are likewise some of them which must be previously prepared in the same manner as is required to render them fit for going through a scorification.—*See the foregoing Processes.*

"*Remarks.* The ore thrown at several times upon lead boiling in a coppel may be dissolved without the foregoing scorification; but this is very far from having an equal success with all kinds of ores; for there are ores and metals which resist very much their dissolution by litharge; and which being on thi account thrown on the border, are not sufficiently dissolved; because the litharge steals away soon into the coppel. Nevertheless, there are some others which vanish entirely by this method, except the silver and gold that was contained in them.

"A previous roasting is necessary, first, for the reasons mentioned, and then because the ore thrown upon boiling lead should not crackle and leap out; for, having once passed the fire, it bears the most sudden heat."

PROCESS VI.

Silver may be precipitated out of the same bodies as were mentioned in the foregoing processes by scorification in a crucible. [*Cramer, Proc.* 15.]

"The body out of which you intend to precipitate silver must be previously prepared for a scorification by pounding and roasting, as mentioned in the former processes. Then, in the same manner, and with the same quantity of lead, put it into a crucible strictly examined, that it be entire, solid, not speckled with black spots, like the scoria of iron, especially at its inferior parts, and capable of containing three times as much. Add besides glass gall and common salt, both very dry, and enough, that when the whole is melted, the salts may swim at top at the height of about half an inch.

"Put the crucible thus loaded into a wind-furnace; shut it close with a tile; put coals round it, but not higher than the upper border of the crucible. Then light them with burning coals, and increase the fire till the whole melts very thin, which will be done by a middling fire, maintained always equal, and never greater; leave it thus for about one quarter of an hour, that the scorification may be perfectly made. Take off the tile and stir the mass with an iron wire, and a little after pour it out into the mould. When the regulus is cleaned from scorias, try it in a test by coppelling it.

"*Remarks.* The scorification of any ore whatever, or of any body fetched out of ores, may indeed be

Amalgamation of Silver and Gold Ores.

be made by this apparatus, as well as in a test under a muffle: but it serves chiefly to the end that a greater quantity of metal may be melted from it with profit. For you may put many common pounds of it at one single time into the crucible; but then you need not observe the proportion of lead prescribed in the foregoing process; nay, a quantity of lead two or three times less is sufficient, according to the different qualities of the object. But the mass will certainly be spilt, unless you choose a very good crucible; for there is no vessel charged with litharge that can bear a strong fire having a draught of wind, without giving way through it to the litharge.

"You add glass-gall and common salt, that they may forward the scorification, by swimming at top; for the refractory scoria rejected by the litharge, and adhering between this and the salts that swim at top, is soon brought to a flux, and the precipitation of the silver is thereby accelerated. They also hinder in a manner a small burning coal fallen into the crucible, from setting the litharge a boiling, which troubles the operation; for the litharge or glass of lead, especially that which is made without any addition, so soon as the phlogiston gets into it, rises into a foamy mass, consisting of a multitude of small bubbles very difficult to be confined, unless the phlogiston be entirely consumed, and the litharge reduced to lead, which sometimes rises above the border of the vessel."

The *corneous ore*, if it really be, as Cronstedt says, a luna cornea, ought to be treated in some of the methods directed for the reduction of luna cornea. See *Chemistry-Index*.

PROCESS VII.

Silver and gold may be extracted from their ores by mercury.

A new method of extracting the precious metals by means of amalgamation with mercury has lately been introduced into Germany. The attraction between these has indeed been known from the most remote antiquity: Vitruvius informs us, that by this means gold might be recovered from embroidery and old cloaths; and Pliny mentions the gilding of brass and other metals by the same means. From time immemorial mercury has been made use of in the streaming for gold, in order to purify and collect together the gold dust which is dispersed in the sands; and almost all nations who practise this use the same process. The gold sand, after being washed, is triturated with quicksilver, and the superfluous metal separated by straining through leather. By the miners it was used in a similar manner; the stones containing gold being first pounded and then triturated in mills along with the mercury. But it was soon found, that in these mills there was a large quantity left behind in the residuum, so that it was necessary to subject what was left to the action of fire; on which account the mills were deemed unnecessary, and are now almost every where disused. The process of extracting gold and silver by amalgamation, however, was looked upon to be essentially deficient, by reason of an opinion which prevailed among the chemists, that mercury could not dissolve either of these metals except in their pure and perfect state; whence it was supposed, that a great quantity which fire could have extracted was left by the mercury. This opinion was supported by the most celebrated metallurgists, as Schlutter, Gellert, Wallerius, and Kramer; whence it became generally believed, that amalgamation would never answer in great operations. But of late Baron Inigo Born has not only demonstrated that this can be done to great advantage, but has actually introduced it, notwithstanding that some difficulties were thrown in his way. The following is an account of the methods which have been practised for separating gold and silver from their ores by means of quicksilver.

Baron Born's New Process, translated by Raspe, 4to, 179[illegible]

This process was introduced into some of the mines of Mexico in 1566 by Don Pedro Fernandez de Velasco, and in 1571 into some of those of Peru by the same person; and from thence it quickly spread thro' all the mines in the south and north-east parts of America, insomuch that it is almost the only method used in that part of the world for extracting these metals. The richer ores, however, are purified by fusion with lead; and our author informs us, that formerly the poorer kinds of ores were certainly thrown away, and when the method of amalgamation was introduced into Peru, the old barrows were searched for the ores which had been rejected as useless, but were now put to the quicksilver.

In the year 1588, Don Juan de Corduba, a Spaniard, applied to the court of Vienna, proposing to extract silver from its ores, whether poor or rich, by mercury, and in a short space of time. He made some experiments upon different kinds of ore, which on a small scale succeeded very well, but on attempting it with 20 quintals of it he failed; and as Lazarus Erker, who was employed to give in a report concerning it, disapproved of the method, it was not pursued any farther. The reasons alleged in Baron Born's book for this failure are, that he did not calcine his ore; that he did not use any salt; and that the weather was too cold; though this last circumstance might have been remedied had Corduba attended to it.

Another Latin and anonymous account of the mode of amalgamation is preserved among the records of the aulic chamber. It is directed to the emperor, but the year in which it was written is not mentioned. According to the account given by the author of this paper, he had examined the mines of Guatimala in New Spain, and made some useful regulations for them. He directs the ore to be calcined in furnaces like limekilns, the fire being kept up according to the nature of the ores, after which they are to be reduced to powder in mills or stamps. The pulverised matter is then passed through fine iron sieves, and put into earthen or copper vessels by 10 or 20 quintals at a time; more or less salt being mixed with it according to circumstances. The light-coloured ore requires 50 lb. to every thousand, and the darker somewhat more. To this mixture are to be added five pounds of dry tartar, two pounds of pulverized horn, and three pounds of brick-dust. Some kinds of ores require but a small quantity of these additions.

After the mixtures are put into the boilers, as much water is added as will make the whole of the consistence of paste moderately thick; the vessels must be exposed to sunshine, or kept in a place warmed artificially, adding more water when the matter begins to dry; and it must

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must be stirred up three or four times a-day. At the expiration of three or four days, various colours appear upon the surface. After this 15lb. of brimstone is to be added to every thousand pounds of ore, and the whole worked over again; but this addition is by the baron considered as quite superfluous. Lastly, 100lb. or less of quicksilver is added, according to the nature of the ore; the whole mass is carefully worked over, and left at rest for 10 hours. A fire must next be kindled under the boiler, and the matter it contains triturated or stirred for two days together; keeping it always sufficiently diluted by a proportionable quantity of water. It is, lastly, allowed to rest for 12 hours, and then dried.

When this operation is successfully performed, if the ores be rich, particles of amalgam will be seen in it: these are collected, washed out, and kept for further use, the leavings being carried to a place fit for washing over. This place ought to be on the slope of an hill, where a kind of pit is dug out and lined with brick and mortar, and ought to be large enough to contain 25 quintals. A stream of water is then made to run upon it, and the matter stirred without intermission. The superfluous water runs over the rim of the pit, and carries off the lighter stony and earthy particles, the heavy amalgam remaining at bottom. This is then to be mixed with the small clots already mentioned, which were taken out of the mass originally, and pressed through a cloth made of hemp or coarse linen. The quicksilver, which comes through clean, is kept for farther use; the remainder distilled off in proper vessels, and the remaining silver melted into ingots. By this method it is said that even very poor ores are worked to advantage, the expence being very moderate.

The following method of extracting gold from its ores is very much recommended by our author: "The auriferous sand, which contains gold grains and gold-dust, is concentrated by washing; and without any calcination goes to the above mentioned washing-pit, which for this purpose need not be so large. On its upper part is fixed a square launder, about 12 feet long, covered in the bottom with a woollen cloth, in order to retain any part of the gold-dust which may be carried over with the water and stuff gently stirred in the pit. When the water carries off no more mud, but runs clear, the farther supply is to be stopped; the water in the pit is pumped or taken out with buckets; the coarser sand in the bottom is separated or scraped off by hands; and the finer heaviest sand at the bottom is mixed with quicksilver. Then it is squeezed through a piece of cloth; the quicksilver comes off without any gold, which separated from the sand remains as an amalgam, and is pure after the remaining quicksilver has been evaporated. The sand and heavier dust remaining on the launder is washed and treated in the same manner.

"The auriferous ores and loadstones, however, which rise from different mines, are calcined like silver ores, more or less as the nature of their matrixes will direct. Then they are ground and sifted; and the auriferous stuff, thus prepared, is put into heaps, exposed to the sunshine, and worked and turned about for three or four days. It requires no salt. Afterwards sulphur, and at last quicksilver, are added and mixed with it. There is no occasion for fire under the vessel in which it is triturated, except in winter; and two days after, though not dried, it is immediately carried to the washing-pit, and treated like the amalgam of silver.

"This method of extracting gold and silver is so certain and safe, that when other methods of amalgamation extract only one ounce of gold and silver, this produces three or four from the poorest ores in a shorter time and with less expence."

P. Joseph Acosta tells us, that at Potosi 6000 or 7000 quintals of quicksilver are annually consumed in the dressing of the ore, not to mention what is recovered from the leavings of the first washing. These leavings, called *lamas*, are burnt in particular furnaces in order to extract the remaining quicksilver; and there are upwards of 50 such furnaces near Potosi and Tarapaja. The ore refined there amounts, according to the best information, to the immense quantity of 300,000 quintals. Only about 2000 quintals of the quicksilver are recovered, which shows a loss of about two pounds of quicksilver on every quintal of ore. The ores are of different natures, and in proportion to the silver they contain require more or less quicksilver. That which contains most, requires naturally the greatest quantity of quicksilver; though some of the workmen pretend that there is a kind which contains very little silver, and yet requires a great deal of mercury: but whether this be owing to the ignorance of the workmen, or to the mercury being absorbed by some other matter, is not generally known. The ore is first pulverised in mills, and then passed through iron or brass sieves. The mills will grind, when properly regulated, 30 quintals in the space of 24 hours. The pulverised matter is put into heaps in the open air, and salt is mixed with it in the proportion of 5 to 50 quintals of the ore, in order to macerate and cleanse it of its impurities, that the quicksilver may the more readily amalgamate with the metal. Upon these heaps, and while they are stirring, the quicksilver is pressed through a cloth. Before the invention of fire-places, the ore was repeatedly kneaded with quicksilver in wooden troughs, and formed into large round masses, which were left in that form for two days; after which they were worked again, until the metals appeared to be embodied together, which took from 9 to 20 days; but it was afterwards found that heat assisted the operation so far, that by means of proper ovens the same might be accomplished in five or six days. When the quicksilver has taken up the silver, and wholly separated it from its matrix the lead and the copper, the ovens are opened, the matter is taken out, and the quicksilver expelled and recovered in the following manner. The mixture is put into water troughs, and stirred therein by means of mills and water-wheels, by which the earthy and extraneous particles are washed away, and the amalgam settles at the bottom. The sediment looks like sand. It is further washed over in flat plates, and perfectly cleansed; what goes off with the water is collected for further use under the name of *relaves*. When the amalgam is become clean and bright by this method, it is put into a cloth and squeezed out. The uncombined quicksilver

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silver runs off, and the remaining body of amalgam contains five parts of quicksilver and one of solid metal. It is made into masses named *pinnas*, having the form of a sugar loaf, hollow within, and weighing about 100 pounds. They are exposed to a strong fire in order to expel the quicksilver, after being put into pots covered with earthen heads. The silver still appears in the form of amalgam, but is reduced to one sixth of the former weight. Its texture is spongy, and the quality of the metal so fine, that the silversmiths cannot work it, neither can it be formed into coin, without an alloy. Baron Born observes, however, that it is only cold amalgamation which produces silver of such uncommon fineness; by hot amalgamation it is generally alloyed with copper, which cannot be parted from it without cupellation.

The most circumstantial account of the amalgamation of silver ore is that of Alonzo Barba. He divides the ores into two classes: 1. those which are best treated by fire and fusion; and, 2. such as are most fit for amalgamation. Those called *pacos* and *tacana*, may be amalgamated; but that none of their richer contents may be lost, it will be best to combine them with lead, and proceed by cupellation. The former of these ores has no lustre or brightness. It is said to be of a reddish-yellow, soft and friable; seldom rich in silver, and mostly valuable on account of its being easily got from the mine. Tacana is a rich silver ore, of a black colour, sometimes of a grey or of an ash-colour; or a brown, rich, silvery earth. 3. The *plomo* is too rich for pulverisation and amalgamation, and is therefore simply melted down with the tacana. This seems to be the same with the horn-silver ore; and is described as almost entirely consisting of native silver, of a black, grey, or greenish-white colour. Barba says that they found at Potosi some plomo of a cinnabar colour, which they had not seen any where else; but Baron Born thinks that here he has mistaken the red silver ore for another species. Frezier asserts, that in what he calls the *plomo ronco*, the native silver appears upon rubbing or scratching it, and that it gives white and very pure silver by simple fusion without any amalgamation. In the imperial cabinet at Vienna, there is a specimen weighing about a pound, of black horn silver ore from Potosi, on the polished surface of which the virgin silver appears very plainly. 4. The *machacado* (virgin silver or gold grown in the matrix in the form of wire or hair), is amalgated in the mortar. 5. The *soroches* (lead ores containing silver), are melted along with the *rosicler* and *conchiso*, two kinds of red silver ore. 6. The *negrillos* (grey copper and white silver ores) may be refined by amalgamation, though they are more fit for fire.

Besides this classification into such as are fit for fire, and those for amalgamation, the ores require further to be sorted into such as require the addition of particular substances for their amalgamation. Vitriol is generally hurtful, especially when salt is added to the vitriolic ores; and it requires the addition of iron, tin, lead, and lime, in order to counteract its effects; but in some cases it is of service, and promotes amalgamation. The calcination of vitriolic ores is of no service, but rather the contrary, as it disengages the vitriol, and brings on a vitriolic efflorescence. It may, however, be separated by washing till the water comes off tasteless and sweet. The amalgamation is disturbed by sulphur, bitumen, and antimony, only by the smoothness and needle-like figure of the particles, which reduce the quicksilver to a kind of dust. The ores mixed with these always run into reguli, and must therefore be put into a strong calcining fire; if melted without calcination, they would run entirely into dross and scoria.

The finer the ores are pounded so much the better; and after putting the powder thro' a fine sieve, the coarser part goes again to the mill: they ought to be previously burnt, in order to assist the operation of grinding. The best method of obtaining fine powder is by washing over; but as this is very apt to pack and turn clammy, it ought to be mixed with sand.

The ores are known to be sufficiently calcined by their change of colour and loss of brightness. Barba tells us, that all bright ores must be calcined, but with great care, that no vitriol may be disengaged, as that proves injurious to the amalgamation; but baron Born says, that one of the greatest objects in the calcination of the Hungarian ores is to decompose the sulphur into vitriol, as promoting the decomposition of the salt. The amalgamation is likewise promoted by burning and calcination, in as far as it promotes the pulverization of the ore, and assists the action of the quicksilver; but it is chiefly useful in the black and grey silver ores. It can only be determined by circumstances whether it be better to pulverize the ores before or after calcination. Their value is best known by pounding them previous to calcination. The stuff must be constantly stirred during the time it is calcining, and some powder taken from the mass to be tried with quicksilver and salt. The thickening of the quicksilver, and the grain of the stuff, show what additions are necessary, or whether the calcination be completed or not. When ores are calcined in lumps, the fire does not act equally upon all their parts; though this method is attended with the advantage of losing much less dust, as well as saving the expence of stamps and mills.

Ores cannot be calcined in reverberatory furnaces, as the heat would run it together, and part of the metals themselves would be carried off by the strong current of air and the violent smoke. Barba recommends a furnace of an oblong square figure, with three vaults over each other; the fire is put into the lowermost, and the ore into the two upper ones. The heat circulates by means of lateral openings in the walls, and is let out on the back without a flue. The heat is graduated by registers and dampers on the outside.—Whatever kind of furnace, however, is used, some of the ore will have clotted, and must therefore be ground to a fine powder; but to prevent as much as possible these inconveniences, the hard ores ought to be calcined before they go to the mill, and the soft ones after, but with proper additions. The irony ores, which resist the fire longer, are calcined with an addition of sulphur, or of sulphureous and antimonial matter, proportioned to the iron they contain; but sulphureous and antimonial ores require to be calcined with the scoria of iron. Arsenical ores, or those mixed with orpiment and sandarac, are calcined with lead glance; and those mixed with white or black bitumen, must be calcined with iron scoria or pounded limestone.

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The impurities of ores, and the additions proper to be made to them, are determined by pounding them coarsely, and throwing them upon a heated plate of iron. If the smoke be white or black, it shows a mixture of bitumen of these colours; if yellow, it shows orpiment; if red, sandarac; if greenish-yellow, sulphur.

Salt ought not to be used in the calcination of ores, as it would calcine the silver; and the duration of the calcining must be determined by the change of colour which the ores undergo by calcination by themselves, and the brightness they assume by trituration with quicksilver. It is also a mark of sufficient calcination when antimonial and sulphureous ores no longer send out a disagreeable smoke; if the thick and black smoke of bituminous ores become white; and if the silver in the stuff appears in white glittering sparks. Vitriolic ores may also be calcined in the same manner; but they require a longer time with the addition of alum and salt: they, however, require no farther addition in the subsequent operations; and in the course of four days all their silver will be taken up by the quicksilver. Less quicksilver will also be lost; for as there is no occasion for the frequent turning and working of the heap, a very small part of it only can be turned into useless dust. Vitriolic ores ought always to be well washed with water before they are calcined; and if there is still a suspicion of their being vitriolic, they must be tried by quicksilver: if it takes a lead-colour, the stuff must be washed till iron put into it no longer takes a copper colour. The lixivium is kept as an useful addition to some ores.

Amalgamation, according to Alonso Barba's method, is performed in three ways, viz. in heaps or caxons, in the boiler, and in mortars.

1. *In heaps.* Before the operation takes place in the large way, an essay is made of three or four pounds of the fine sifted powder taken from the general quantity; and according to the produce of this he calculates that of the whole. He tries it also with quicksilver, to know perfectly the method he is to follow, and the additions that are to be made. In this essay the following method is adopted: 1. The matter is elixated, to extract the vitriol if there be any. 2. One pound of the lixiviated matter is tried with quicksilver and salt, carefully observing the colour and its change. If the quicksilver assumes the appearance of silver filings, and these quicksilver flakes become thinner and thinner, it proves that the amalgamation goes on successfully, and that there is no occasion for any addition. The whole is stirred from time to time, till the quicksilver seems to diminish, and recover its natural form, but without dividing into small globules; after which the matter is to be washed, as all the silver is by that time completely taken up. The ores of *Verenguela de Pacages* are treated only with quicksilver and salt, and yet yield their full produce.

When the ore turns black, iron is added; when of a light lead-colour, tin; if a dark lead-colour, lead; and if of a yellowish or gold-colour, lime. The three last of these are styled by Baron Born, "very idle and useless additions."—The ore frequently divides into small and powdery globules, in consequence of the hardness of the minerals, or from too much stirring; but this may be prevented by calcination before it is reduced to powder, or by less stirring. In a great many operations, however, this quicksilver dust can scarcely be avoided. It serves the workmen as an index of the progress they have made, or sometimes as a direction how to operate; and has different names according to the cause by which it is produced; as quicksilver dust, the dust of addition, and silver dust. The first of these arises simply from too great division, and is white without any quickness, scarcely moving when the matter is stirred with water: it sticks somewhat to the bottom, and runs into globules when broken between the fingers. The second is produced by the amalgam of lead and tin; and, when pressed between the fingers, unites with the quicksilver which had begun to combine with the silver. The third comes from the amalgam of silver: it sinks towards the coarser stuff on the bottom, and floats about in flakes of different sizes; turning into an amalgam when rubbed or pressed between the fingers. All of these are produced chiefly when there are lead, marcasite, and irony ores in the mixture; or by vitriol of copper, which is particularly productive of this minute division of the quicksilver. They are produced also by too plentiful an addition of salt, which thickens the water, and prevents the descent of the particles of quicksilver.

According to the produce of the essay the large heap is regulated. It is first wetted with water, and mixed with the due proportion of salt; but at the beginning only one third of the quicksilver and one half of the lead and tin are added. It is turned over once every day during the two first days, because the quicksilver being then uncombined would be apt to be driven off in small globules, and a great waste occasioned. The heap is likewise too much cooled by the addition of too much quicksilver at once; so that it is better to put it gradually to the other matters. The lead and tin are always thrown into the heap along with the quicksilver; but too much of either is hurtful, by deadening the quicksilver, and preventing the amalgamation. All these additions, however, must vary according to circumstances; observing that the quantities added must always be less and less in proportion as the amalgam advances to perfection. The matter should be kept rather dry than otherwise, and two parts of amalgam be in the heap to one of fluid quicksilver. Too great an abundance of this fluid mass is very detrimental, on account of the quantity of quicksilver dust which it occasions; and if the other ingredients are accidentally wasted, the *dust of addition* will be changed into *quicksilver dust*; which having very little weight, will be poured off along with the water. But when lime is added, the whole must be mixed at once, and the entire heap turned over two or three days, till the quicksilver be added. Too much lime prevents the union of the two metals, and is an inconvenience which cannot be remedied.

The heaps are frequently turned and worked over after the first two days, which is attended with several advantages; as that the quicksilver is thus heated, more thoroughly mixed with the matter, and the silver is purified by the frequent rubbing. The heaps, however, are subject to various accidents, owing to the

the difference between the various kinds of ores, which cannot always be exactly known. When the quickfilver is deadened by too large an addition of lead, iron, tin, or lime, it loses its oval form, and assumes a vermicular one: if shaken in a glass, or other vessel, without water, it adheres to the sides in threads, and is unfit for taking up the silver. The best remedy is vitriol of copper, or the lixivium of vitriolic ores already mentioned; or powder of copper may be thrown into the heap. All additions of this kind, however, must be made very cautiously, and in consequence of experiments made by small essays, which determine the quantity of materials to be used. When the heaps have too much vitriol, without any correcting ingredient, the quickfilver has a leaden colour, and the smaller particles assume a spherical form. Iron might be added to absorb the too great quantity of vitriolic acid; but there is no certain rule for the proportion to be added, so that it must be determined by experiment.

When the quickfilver appears, on turning the heaps, like a bunch of grapes, this shows an excess of salt, which prevents the quickfilver from combining with the silver: it is to be remedied by the addition of some coarse stuff which cleanses the fluid. Some add ashes; but the best and most natural remedy is alum, which is found at Potosi in abundance, and whitens the silver. If the heap be not turned equally, or the quickfilver added at a proper time, or if the silver do not unite with it, some of the silver will appear in a dry form, and lie on the coarser stuff like a cobweb; and if not skimmed off in time, will be carried away by the washing water. To collect this dry silver, and the finest quickfilver dust, some silver amalgama is pressed upon it through a chamois skin; and the whole is once more turned and worked over. The frequent turning, the heat of the climate and season, as well as the fermentation produced in the heap by the vitriol and other additions, all promote the amalgamation; but cold, neglect of stirring, and the quickfilver assuming a lead-colour, are against it. It is, however, very difficult to determine the maturity of the heap, when all the silver is taken up, and the matter may go to the washing; though great inconveniences attend an ignorance in this respect. If washed too soon, some silver is left in the leavings; and if worked too long, there is a loss of quickfilver as well as time and labour. The difficulties attending the knowledge of this important point, are by our author enumerated as follow: "The heap may appear not to require any additional quickfilver; the silver dust may appear to be completely collected; that of quickfilver may begin to make its appearance; the amalgama may begin to appear pure, and to show a gold-colour; and yet silver may remain in the leavings. The most infallible test of the maturity of the heap, is the essay of the triturated stuff by fire. If no silver is produced thereby, then so much quickfilver is thrown into the heap, that it may contain three parts of amalgama to two of silver, or at least one part of quickfilver to two of amalgama. By this additional fresh quickfilver, all the dust of quickfilver, and the dry and uncombined quickfilver, are perfectly collected; the amalgam is the heavier for it, and sinks the more readily to the bottom when brought to the washing-tub.— Some clean quickfilver is also put into the bottom of this tub; the inside of which must be lined with iron plate well cleaned, and rubbed with quickfilver;" (though this last operation seems to be quite superfluous, as mercury will not in the least unite with iron by rubbing.) "The stuff brought into the tub must be diluted with a great quantity of water, and be stirred round with a pestle lined with iron-plate in such a manner that it may turn round six times one way and six times the other, always touching the bottom; the unconnected bodies of quickfilver and amalgam are thereby to meet, to combine, and to fall to the bottom. To recover the salt which had been mixed with the heap, the water must be evaporated:" but the Baron observes, that at Shemnitz no salt is recoverable from the lixivium; and if any be recovered by the Spaniards, it only shows that they add too much, and that part of the remainder is undecomposed by the vitriolic acid. The quickfilver is separated from the amalgama much in the same way as already described.

2. *Amalgamation by boiling*, was accidentally discovered by Barba, in an attempt to fix quickfilver.— On mixing silver ore finely powdered with quickfilver, and boiling it with water in a copper vessel, he found that the metals readily united; and thus having discovered a shorter method of amalgamation, he gradually improved and introduced it into practice in Peru. In this operation the boilers must be of copper, earthen or other vessels being found not to answer: the copper also must be pure, because the quickfilver would dissolve the metals with which it is alloyed. They must be in the shape of inverted cones, and flat-bottomed. The under part has a rim of six or eight inches high and half an inch broad, all beat of one piece. Other copper plates are fixed in the inside with copper nails; and care must be taken that it be water-tight, that no quickfilver may run off; and for the better security, the inside of the boiler may be lined with lime and ox-blood. The boilers may be of any magnitude; their upper parts being surrounded with iron rings with strong handles, into which a cross board is wedged. In the middle of this board is a hole for the spindle to move in. The spindle is of light wood, and moves on a brass pivot in the bottom. It has four wooden wings, with three or four perpendicular bars, also of wood; the farthest from the spindle being the shortest; the nighest so long as to sweep the bottom. It is turned by a moveable handle on the upper end.

These boilers are put into an oblong furnace, capable of holding 10 of them; the fire-place being in the middle, and the flame and smoke passing under the boilers, and going out on both ends of the furnace by two chimnies. The fire being lighted, first the water, then the fine stuff, and at last the quickfilver, is put in; observing always that the bottom be fully covered with quickfilver. The water must always be kept boiling, otherwise the operation may be interrupted or become tedious: on account of the evaporation, the boilers must be supplied with a quantity of water, in small quantities at a time, that the boiling be not checked. The stuff must be proportioned to the size of the boiler: if too little be put in, the amalgamation goes on too slowly; while too much would

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not allow the mafs to be thick enough, or to boil with fufficient freedom. Some of the amalgam is to be taken out from time to time with a long laddle, and the progrefs of the operation is judged of by the colour. The effay of the ftuff determines whether all the filver be taken out of it in this manner. Some quickfilver is then thrown upon the furface of a fample of the boiled ftuff, and worked round with it in a veffel two or three times. If the quickfilver rifes and takes up fome of the ftuff, fome filver remains; if not, the whole is taken up. Then the fire is ftopped, the fpindle is taken out, and the water and ftuff let off. The coarfer matter on the quickfilver may at all events be wafhed in cold water, and go once more to the mill. Almoft the whole of the filver amalgama lies upon the furface of the quickfilver, immediately under the ftuff, fometimes four or five fingers thick; the fire under the boilers preventing the filver from uniting with the quickfilver in the bottom. This metal, when poured off, muft be preffed and treated in the ufual manner.

The advantages attending this method are, that the heat promotes the union of the metals, while the boiling of the water and ftirring of the mixture with the fpindle bring them more frequently in contact with each other in a quarter of an hour, than they would be in feveral days in the common method; by which means the whole procefs is finifhed in about 24 hours. Lefs quickfilver is alfo loft by it; for being always covered with water, it cannot evaporate; and in well managed and fuccefsful operations, no quickfilver duft is produced: but the greateft recommendation is, that it is not attended with any lofs of filver, fo that even the pooreft ores will yield all that they contain. Barba looks upon the profit of this method above the other to amount to 25 dollars for every heap of 50 quintals; even making allowance for the coals. The only objections are, that both filver and copper are apt to be loft by the corrofion of the copper-boilers: but if the copper be pure, there is no great reafon to be apprehenfive of any thing of this kind; or, at all events, the bottom of the boiler, which is conftantly expofed to the action of the quickfilver, may be fecured by a copper ring three or four inches high; and the bottom itfelf may be fecured in the fame manner; fo that when corroded they may be changed for new ones: or the boilers may be paved or lined with varnifhes or mortars of different kinds; which will as effectually prevent any lofs. While the whole is boiling, the quickfilver violently feizes on the other metal; by which means the amalgam is filled with many heterogeneous particles. Thefe are feparated by wafhing in quickfilver, on the furface of which they fwim like fcoria, and may eafily be taken off, till the quickfilver fhows its ufual brightnefs; and as this cannot be done without taking off fome of the metals alfo, the fcum may be referved for the next operation. The advantage of amalgamation by boiling chiefly appears in this, that heaps, in which by too large additions, the quickfilver has been totally diffolved fo as to difappear, may be eafily cured by boiling them, in iron or copper veffels with bits of iron; for then the quickfilver appears again in its proper metallic form and brightnefs.

3. *Amalgamation in mortars.* It is difficult to procure the full produce from ores which contain native gold and filver either in the form of hair or wire, or in larger lumps and nodules. Thefe cannot be completely pounded, nor can they be amalgamated; for the mercury will not diffolve the large particles of gold and filver; and when they are treated by fire, the ftubborn nature of their matrices occafions a great lofs of metal. The following method of treating them in a mortar was difcovered by a Francifcan friar.

A round conical hole is cut in a hard ftone, half a foot in diameter at top, of an equal depth, and floping into a truncated, or rather obtufe and nearly flat bottom, of about four inches in diameter. Some quickfilver is poured into it, together with a proportional quantity of fmall bits of the native metal or ore; after which they are triturated with an iron peftle. By this violent trituration, the gold and filver combine with the quickfilver; and the finer, lighter ftuff of red filver ore and other filver calces, which are generally found with native filver, runs off by means of a fmall launder and current of water. It is not, however, fuffered to run away, but is left to fettle for common amalgamation.

Mortars of the dimenfions above defcribed being too fmall for any confiderable quantity of ore, Barba propofes to fubftitute in their place larger ftones of a concave figure, with vertical grinders, as in oil-mills; or common horizontal and parallel grinders of the griftmill. The ore and quickfilver are put between thefe ftones, with a fmall ftream of water; which, running off, will carry away the lighter ftuff, whilft the gold and filver will remain at the bottom, taken up by the quickfilver.

There are feveral other methods of amalgamation defcribed in Baron Born's work, as practifed by the Spaniards of South America: but as all of them agree in the moft material circumftances with thofe already mentioned, we fhall only farther take notice of that invented by the Baron himfelf, and by him lately introduced at Shemnitz in Lower Hungary.

This method is very pompoufly related, and at great length, in his work on the fubject. His theory contains the following particulars:

1. Quickfilver has a tendency to unite with other metals and femimetals, and to *quicken* or *animate* them according to certain laws of affinity which are determined by experience.

2. It unites with gold, filver, copper, tin, lead, bifmuth, and zinc, without heat; but with other metals and femimetals it will not unite but in a ftate of fufion. It unites with tin and bifmuth more eafily than with gold and filver; and with thefe more readily than with copper.

3. The union of quickfilver with other metals is promoted by heat.

4. This union is alfo greatly promoted by mechanical comminution.

5. No amalgamation, or only a very flow and partial one, will take place, if the furface of the quickfilver or metallic particles be covered with a coat of heterogeneous matter; which happens chiefly in the amalgamation of ores where the fine particles of the metal are involved in fulphur and arfenic.

6. Hence it is neceffary to free the noble metals

 from

Amalgamation of Gold and Silver Ores.

from the stony matter which surrounds them, and to reduce the baser ones from their calciform to a metallic state, before they can be amalgamated with success.

7. Particles of gold and silver may be freed from the stony matters which involve them by trituration; and from sulphur and arsenic, by calcination.

8. In calcination, some part of the sulphur is destroyed, and vitriolic acid disengaged; which, combining with the earthy matters contained in the ore, as well as the calces of the baser metals mixed with it, still leave the gold and silver involved: whence it is necessary to employ such chemical agents as will free the particles of these metals from their heterogeneous coat, and keep their surface as well as that of the quicksilver clean, without acting either upon the gold or silver. These agents are principally the mineral acids, which act variously according to their different natures. The marine acid is most efficacious for gold or silver ores; but it would be exceedingly expensive to use it in its proper form, so that it is necessary to take some method of expelling it extemporaneously from common salt by means of oil of vitriol.

9. The calcined ore, when pulverised, must be wetted with water, for the purpose of dissolving the disengaged vitriolic acid and the earthy and metallic neutral salts, which are produced by it in proportion to the sulphur contained in the ore. Vitriol is produced by calcination only in this proportion; and hence if the ore does not naturally contain a sufficiency of sulphur to produce vitriol for the purpose of decomposition, it will be necessary to add something of this kind. Vitriol of copper or of iron will answer, but the former is preferable. If, therefore, the pulverised ore, which has once gone through the process of amalgamation, should still appear to contain gold or silver, mix it with some additional vitriol and common salt; leave it for some time to macerate by itself; and, at a second trituration with quicksilver, a considerable quantity of silver will be found in the amalgama which had not been extracted in the first, though common salt had been used in it. Thus the common salt may be decomposed in the wet way.

10. To decompose the common salt in the dry way, the ore must be properly stamped and sifted, and the mixtures made up with a proportional quantity of pulverised common or rock salt, and then undergo an adequate calcination in an open fire. Thus the common salt will be decomposed according to the nature of the mixture; either by the vitriolic acid produced by the decomposition of the sulphur, or otherwise.—The muriatic acid, thus disengaged, dissolves the heterogeneous particles in which the metals are involved, and allows the quicksilver to act upon them much more effectually than it could have been enabled to do by any mechanical comminution; and this the more so as it takes up even those particles of dephlogisticated iron upon which the other acids are incapable of acting.

11. The calcination and corrosion of the baser metals is indispensably necessary, especially in a natural combination of gold and copper; for the affinity of these two is so strong, that unless the latter be perfectly calcined, or otherwise removed, very little of the gold can be extracted. The separation will also be promoted by the addition of sulphureous substances.

From these considerations, the Baron lays down the following rules concerning amalgamation.

" 1. The ores and mixtures previous to their amalgamation must be mechanically comminuted, and reduced to a fine powder, by stamping, grinding, and sifting, that the surfaces of the particles, and their points of contact, may be increased and multiplied.

" 2. This powder must be calcined, that, besides the pure particles of the nobler metals, those which are disguised in the ore may be disengaged and laid bare by desulphuration and calcination.

" 3. If before its calcination no common salt was added, it must be added afterwards; then it must be triturated with a proportionate quantity of quicksilver and water, long enough, and in such a manner, that the quicksilver, by an uninterrupted motion of the whole mass, may come into repeated contact with the disengaged gold and silver particles, and take them up.

" 4. As much depends on the just-mentioned proportions, the inspector, director, or master of the work, must be well acquainted with the elective attraction of bodies, that forming a just idea *of*, and judgment *on*, their different mechanical or chemical decomposition and combination, he may remedy and remove such untoward difficulties and impediments in the process as may, and will sometimes, prevent its full success."

The various steps by which the metals are extracted from their ores, according to the Baron's method, are, 1. Stamping, grinding, and sifting. 2. Calcination; after which the grinding and sifting must be repeated. 3. Trituration. 4. Washing of the residuum. 5. Eliquation of the amalgama. 6. Heating of the same. 7. Distillation of the quicksilver pressed from the amalgam. 7. Refining of the heated amalgam. 8. Extracting from the residua such parts of the noble metals as may still be contained in them.

1. *Stamping, grinding*, and *sifting*. The Baron recommends dry-stamps and mills for this purpose; as wet-stamps, he says, " would bring on great loss of silver, and expensive contrivances to prevent or recover it." On the other hand, E. Raspe, the translator of his work, says, that " late experiments have proved so much in favour of the wet stamps, that they have actually been adopted as great improvements."

The contents of the ores are accurately investigated by essays before any thing is done in the large way. The ores are delivered to the respective mills; the smaller ores are passed over a brass sieve, the meshes of which are about one-tenth of an inch wide, that the finer particles may be separated and not sent to the stamps, which would occasion some waste, especially in the dry way. The finer sand is sent directly to the mill, and the big lumps to the stamp. Each box, or set of stamps, has three stamp-heads, weighing 40 or 54 pounds, the sole being of cast-iron. The matter is every now and then wetted with water to prevent the finer parts from flying off. When the ore is sufficiently beat in the stamps, it is afterwards sifted, and the coarse part returned to the stamp. When the coarsest part is reduced in this manner to the size of coarse sand, it is sent to the mill; the running stone of which

which must be kept close in a box, and nothing left open but the admission-funnel. The millstones are a kind of porphyry, and the sieves of brass-wire.

2. *Calcination.* The ore being reduced to a sufficient degree of fineness, is next carried to the calcining furnace; previous to which it is again to be tried by essay, and to have the proper additions according to its nature. When the furnace is properly heated, the whole quantity of ore destined to one furnace, about 30 quintals, is brought up to the top by wheel-barrows; and being spread as even as may be, the proper quantity of salt and lime is sifted over it, and the whole turned with crooks and rakes till it be perfectly mixed. The calcination is then performed in the following manner: The back-door being carefully shut, eight hundred weight of the matter, prepared as already mentioned, is let down through a funnel upon the upper hearth. Here it is again to be spread and allowed to dry before it is put down on the lower hearth; and as soon as this is done, another quantity is put upon the upper hearth, that the two operations may regularly succeed each other.

Our author describes at great length all the minutiæ of this operation: but, as he justly observes, "Experience and practice are, and must be, the best teachers; for there are many things which must be attended to, and which words and descriptions will hardly make intelligible." We shall therefore only observe, that the calcining furnace must be kept heated day and night: but while the ore is shoved down from the upper to the lower hearth, the fire must be kept very moderate; and during the calcination it will be necessary to keep the matter constantly turning with iron rakes, the combs or teeth of which are from four to eight inches long.

The grinding and sifting after calcination is only necessary when the matter has run into hard indissoluble clots during the operation; and is performed in a grinding and sifting mill, which turns by water; but which it is unnecessary here to describe, as every possessor of mines would choose such mechanical contrivances as best suit his purpose.

3. *Trituration, boiling,* and *amalgamation.* After the ores have been properly calcined and pounded, the success of the amalgamation depends mostly on the proportions of quicksilver and water which are added to the stuff, and the construction of the stirring apparatus by which the whole is kept in constant motion and mutual contact. The lighter the stuff, the more voluminous and bulky it will prove, and consequently the gold and silver will be the more dispersed: in which case the quantity of quicksilver must be proportioned to the mass, that notwithstanding its constant gravitation towards the bottom it may the more frequently come into contact with the gold and silver. It acts in proportion to its bulk and surface. A larger quantity is therefore advisable, as it not only forms a larger surface on the bottom of the vessel, but comes likewise into contact with the gold and silver more frequently; nor is there any greater loss of quicksilver to be apprehended on that account. A larger proportion of fluid metal is in particular necessary when the matter is mixed with lead or antimony: for, by taking up the lead, it becomes proportionably less active and fit for the reception of gold and silver: and turning greasy by the antimony, it must in the former case leave rich residua, and in the latter bring on greater loss. It is also determined by experience, that the excess of quicksilver never does any hurt, while too small a quantity never fails to be disadvantageous.

With regard to the construction of the boilers, it is needless to be particular, as those recommended by Alonso Barba seem to be very adequate to the purpose. Heat is required: but it is not necessary that the matter should boil, a moderate fire being sufficient for making the metals unite. Nor is there occasion for more water than what will make the matter liquid. The stirring apparatus is put in motion by the crank of a water wheel, and a horizontal rack with cogs; which, being properly fixed in a groove by cross bars, slides forward and backward on brass rollers and casters. The cogs of this rack catch into those of the perpendicular trundle and spindle of the stirrers, which turns round twice by three and an half feet motion of the sliding rack. The whole moves quicker or slower in proportion to the box of water thrown upon the wheel; and the quicker motion of the rack produces of course a quicker turn and better trituration. The stirrers must be circular segments corresponding with the sides and bottom of the boiler, otherwise their motion is irregular and unsatisfactory. The time of trituration, as depending on the nature of the ore, must be determined by experience.

4. *The washing of the triturated leavings or residuum* is performed in large tubs, and requires no particular description, farther than that it be continued till all the soluble matter be got out; and for this purpose there must be a contrivance for stirring the matter all the time it is washing.

5. *Eliquation of the quicksilver and amalgama.* Formerly this was performed in bags made of deer-skins, strongly compressed with engines for the purpose; but this being found too expensive, it is now done by small quantities at a time, and pressed only by the hand till the ball of amalgam yields no more quicksilver. A small quantity always remains in the quicksilver which passes through; and this quantity is the greater in proportion to the warmth of the amalgam when pressed.

6. The *distillation of the amalgam* is performed *per descensum* in large iron pots. The undermost stands upright to its middle in a stream of cold running water which passes under the hearth; the upper part hardly appearing two inches above it. The amalgam, made up into balls, is placed in iron cullenders fixed upon a tripod set in the bottom of the lower pot, and covered in the inside with a coarse cloth. The upper pot is inverted on the lower one; and the juncture being luted, the fire is put all round the outer one, and the heat passing through to the amalgam quickly liquefies it, and raises the quicksilver in vapour, which condenses in the under pot continually kept cool by the stream of water. The upper pot is kept in a strong red heat for five or six hours; by which means the cloth is entirely converted into tinder, so that the cullenders must afterwards be cleaned with a brass brush.

The other operations contain nothing particular but what may be easily understood from what has been already delivered.

Copper Ores.

Sect. IV. *Ores of Copper.*

§ 1. Copper is found under ground in three different forms: 1. Native or virgin copper diversely ramified, which is much more rare than native silver. This native copper is not so ductile as copper purified by fusions from the ore (A). 2. Copper is found in form of calx, of verdigrise, of precipitates. Such are the minerals called *silky copper ores*, and several white and green earths. These matters are only copper almost pure and but little mineralised, but which has been corroded, dissolved, precipitated, calcined by saline matters, by the action of the air, of water, and of earths (B). 3. Copper is frequently in a truly mineral state, that is, combined with sulphur and with arsenic, with other metallic matters mixed with earths, and enveloped in different matrices (C). These are the true copper ores. They have no regular forms except they partake of the nature of pyrites. Their colours are very different, which depend chiefly on the proportion of the mineral substances composing them. Lastly, in almost all of them we may perceive green or blue colours, which always indicate an erosion or calcination of the copper. Most copper ores contain also some iron or ferruginous earth, to which the ochrey colour is to be attributed, which might make us believe them to be ores of iron. Ores which contain much iron are the most difficultly fusible.

Copper ores have almost all a yellow, golden, and shining colour, by which they are easily distinguished. Some of them are coloured with irises, and frequently have spots of verdigrise, by which also they are distinguishable from other ores.

Many copper ores are also rich in silver. Such is that called the *white copper ore*, the colour of which is rather occasioned by arsenic than by silver, although it contains so much silver as to be enumerated by several mineralogists amongst silver ores.

Lastly, the pyrites of a golden yellow colour which contains copper and sulphur, and the white pyrites which contains copper and arsenic, are considered as copper ores by several chemists and naturalists. Henckel and Cramer remark, that no proper ore of copper is known which does not contain a considerable quantity of arsenic.

Essaying of Ores of Copper.

§ 2. *Ores of copper* may be *essayed* in methods similar to those employed for smelting of large quantities of ores (Part III.), or they may in general be essayed by the following processes.

PROCESS I.

To reduce and precipitate copper from a pure and fusible ore in a close vessel.

"Mix one, or, if you have small weights, two docimastical centners of ore beat extremely fine, with six centners of the black flux; and having put them into a crucible or pot, cover them one inch high with common salt, and press them down with your finger: but let the capacity of the vessel be such that it may be only half full; shut the vessel close, put it into the furnace; heap coals upon it, so that it may be covered over with them a few inches high; govern the fire in such a manner that it may first grow slightly red-hot. Soon after you will hear your common salt crackle; and then there will be a gentle hissing noise. So long as this lasts, keep the same degree of fire till it is quite over. Then increase suddenly the fire, either with the funnel and cover put upon the furnace, or with a pair of bellows applied to the hole of the bottom part, that the vessel may grow very red-hot. Thus you will reduce and precipitate your copper in about a quarter of an hour: then take out the vessel, and strike with a few blows the pavement upon which you put it, that all the small grains of copper may be collected in one mass.

"Break the vessel, when grown cold, in two, from top to bottom, as nearly as you can: if the whole process has been well performed, you will find a solid, perfectly yellow and malleable regulus adhering to the bottom of the vessel, with scorias remaining at top of a brown colour, solid, hard, and shining, from which the regulus must be separated with several gentle blows of a hammer; this done, weigh it, after having wiped off all the filthiness.

A soft, dusty, and very black scoria, is a sign of a fire not sufficiently strong. Small neat grains of copper

(A) *Native copper* is solid; or consisting of friable masses, formed by precipitation of cupreous vitriolic waters, called *cement* or *ziment copper;* or forming crystallized cubes or grains, leaves, branches, or filaments.

(B) *Calciform ores* are either pure calces of copper, or are mixed with heterogeneous matters. 1. The *pure* are loose friable ochre, called *cæruleum montanum* "mountain-blue," and *viride montanum* "mountain-green;" and the *red indurated calx*, called improperly *glass copper ore*. 2. *Mixed* calciform ores are those in which the calx of copper is mixed; with *calcareous earth*, forming a mountain-blue; with *iron*, forming a black calx; with *gypsum*, an indurated green ore, called *malachites;* and with *quartz*, a red ore.

(C) Copper is *mineralised*, 1. By *sulphur*, forming the *grey copper ore*, improperly called *vitreous* (minera cupri vitrea Wallerii). 2. By *sulphurated iron*, forming the *hepatic copper ore* (minera cupri hepatica Wallerii) of a brown yellow colour. It is a kind of cupreous pyrites, and is called by Cronstedt *minera cupri pyritacea.* Sometimes it is of a blackish grey colour, and is then called *pyrites cupri griseus* (minera cupri grisea Wallerii); sometimes of a reddish yellow, and tarnished with blue irises on its surface, when it is called *minera cupri lazurea;* when of a yellowish green colour, it is the *pyrites cupri flavo-viridescens* (cuprum sulphure et ferro mineralisatum Wallerii); and when of a pale yellow colour, it is the *pyrites cupri pallidè flavus.* Most of the above pyritaceous ores contain also some arsenic, but their sulphur is predominant. 3. *Copper mineralised by sulphur, iron, and arsenic. White copper ore* (Minera cupri alba Wallerii). This ore contains also some silver. 4. *Copper dissolved by vitriolic acid. Native blue vitriol.* 5. *Copper united with bitumens. Copper-coal ore.* This is a pit-coal, from the ashes of which copper is obtainable. 6. Copper is also found in the mineral called *kupfer nickel.*

Essaying of Ores of Copper.

per reduced but not precipitated, and adhering still to scorias, especially not very far from the bottom, and an unequal and ramificated regulus, are signs of the same thing. A solid, hard, shining, red-coloured scoria, especially about the regulus, or even the regulus itself when covered with a like small crust, are signs of an excess in the degree and duration of the fire.

"*Remarks.* All the ores which are easily melted in the fire are not the objects of this process; for they must also be very pure. Such are the vitreous copper ores." (Mr Cramer means, it is presumed, the red calciform ore, called improperly *glass ore*, and not the *minera cupri vitrea* of Wallerius, which being composed of copper mineralised by sulphur, could not be treated properly by this process, in which no previous roasting is required. The sulphur of this ore would with the alkali of the black flux form a hepar, from which the metal would not precipitate). "But especially the green and azure-coloured ores, and the *cæruleum* and *viride montanum*, which are not very different from them. But if there is a great quantity of arsenic, sulphur, or of the ore of another metal and semimetal joined to the ore of copper, then you will never obtain a malleable regulus of pure copper, tho' ores are not always rendered refractory by the presence of these."

PROCESS II.

To reduce and precipitate copper out of ores rendered refractory by earth and stones that cannot be washed off.

"Beat your ore into a most subtile powder, of which weigh one or two centners, and mix as much sandiver to them. This done, add four times as much of the black flux with respect to the ore; for by this means, the sterile terrestrial parts are better disposed to a scorification, and the reducing and precipitating flux may act more freely upon the metallic particles freed from all their incumbrances.

"As for the rest, make the apparatus as in last process: but you must make the fire a little stronger for about half an hour together. When the vessel is grown cold and broken, examine the scorias, whether they are as they ought to be. The regulus will be as fine and ductile as the foregoing.

"*Remarks.* As these copper ores hardly conceal any sulphur and arsenic in them, the roasting would be of no effect, and much copper would be lost. For no metallic calx, except those of gold and silver, improperly so called, can be roasted, without you find a part of the metal lost after the reduction.

PROCESS III.

To precipitate copper out of an ore (D) *that contains iron.*

"Do all according to last process. But you will find, after the vessel is broken, a regulus upon no account so fine, but less ductile, wherein the genuine colour of the copper does not perfectly appear, and which must be further purified.

"*Remarks.* The fire used in this operation is not so strong that the iron should turn to a regulus. But as copper is the menstruum of iron, which is of itself very refractory in the fire; for this reason, while the ore and the flux are most intimately mixed and confounded by trituration, the greatest part of the iron being dissolved by the copper, turns into a regulus along with it."

PROCESS IV.

The roasting of a pyritose, sulphureous, arsenical, semimetallic, copper ore.

"Break two docimastical centners of the ore to a coarse powder, put them into a test covered with a tile, and place them under the muffle of a docimastical furnace. But the fire must be so gentle, that the muffle may be but faintly red-hot. When the ore has decrepitated, open the test and continue the fire for a few minutes; then increase it by degrees, that you may see the ore perpetually smoking a little: in the mean time, it is also proper now and then to stir it up with an iron hook. The shining particles will assume a dark red or blackish colour. This done, take out the test, that it may grow cold. If the small grains are not melted, nor strongly adherent to each other, hitherto all will be well; but if they run again into one single cake, the process must be made again with another portion of the ore, in a more gentle fire.

"When the ore is grown cold, beat it to a powder somewhat finer, and roast it by the same method as before; then take it out, and if the powder is not melted yet, beat it again to a most subtile powder; in this you are to take care that nothing be lost.

"Roast the powder in a fire somewhat stronger, but for a few minutes only. If you do not then find the ore any way inclined to melt, add a little tallow, and burn it away under the muffle, and do the same another time again, till, the fire being very bright, you no longer perceive any sulphureous, arsenical, unpleasant smell, or any smoke; and there remains nothing but a thin, soft powder, of a dark red, or blackish colour.

"*Remarks.* Every pyrites contains iron, with an unmetallic earth; to which sulphur or arsenic, and most commonly both, always join. Besides, there is copper in many pyrites; but sometimes more and sometimes less: some of them are altogether destitute of copper; therefore, so much as pyrites differ with regard to the proportion of their constituent particles, so much do they differ as to their disposition in the fire. For instance, the more copper there is in pyrites, the more it inclines to colliquation. The more sulphur and arsenic it has in it, the more quickly the melting of it will be procured, and the reverse: the more iron and unmetallic earth it contains, the more it proves refractory in the fire. Now if such pyrites melt in the roasting, as happens to some of them if they grow but red-hot, the sulphur and arsenic that lies hidden therein are so strictly united with the fixed part, that you would in vain attempt to dissipate them. Nay,

(D) Mr Cramer still means the calciform ores only, and not the mineralised ores of copper.

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Nay, in this case, when it is reduced again into a powder, it requires a much greater time and accuracy in the regimen of the fire to perform the operation. For this reason, it is much better to repeat it with new pyrites. But you can roast no more than the double quantity at once of the ore you have a mind to employ in the foregoing experiment; to the end that, the precipitation by fusion not succeeding, there may remain still another portion entire; lest you should be obliged to repeat a tedious roasting. If you see the signs of a ferreous refractory pyrites, the operation must be performed with a greater fire, and much more quickly. However, take care not to do it with too violent a fire: for a great deal of copper is consumed not only by the arsenic, but also by the sulphur; and this happens even in vessels shut very close, when the sulphur is expelled by a fire not quite so strong; which a reiterated and milder sublimation of the sulphur in a vessel both very clean and well closed will clearly show.

"When the greatest part of the sulphur and the arsenic is dissipated by such causes as promote colliquation, you may make a stronger fire: but then it is proper to add a little of some fat body; for this dissolves mineral sulphur: it changes the mixture of it in some part, which, for instance, consists in a certain proportion of acid and phlogiston; and at the same time hinders the metallic earth from being reduced into copper, by being burnt to an excess. From these effects, the reason is plain, why assayers produce less metals in the trying of veins of copper, lead, and tin, than skilful smelters do in large operations. For the former perform the roasting under a muffle, with a clear fire, and without any oily reducing menstruum; whereas the latter perform it in the middle of charcoal or of wood, which perpetually emit a reductive phlogiston.

"The darker and blacker the powder of the roasted ore appears, the more copper you may expect from it. But the redder it looks, the less copper and the more iron it affords; for roasted copper dissolved by sulphur or the acid of it is very black, and iron, on the contrary, very red.

PROCESS V.

The precipitation of copper out of roasted ore of the last process.

"Divide the roasted ore into two parts: each of them shall go for a centner: add to it the same weight of sandiver, and four times as much of the black flux, and mix them well together. As for the rest, do all according to the process I.: the precipitated regulus will be half malleable, sometimes quite brittle, now and then pretty much like pure copper in its colour, but sometimes whitish, and even blackish. Whence it is most commonly called *black copper*, though it is not always of so dark a dye.

"It is easy to conceive, that there is as great a difference between the several kinds of that metal called *black copper*, as there is between the pyritose and other copper ores accidentally mixed with other metallic and semi-metallic bodies. For all the metals, the ores of which are intermixed with the copper ores, being reduced, are precipitated together with the copper, which is brought about by means of the black flux. Wherefore iron, lead, tin, the reguline part of antimony, bismuth, most commonly are mixed with black copper in a multitude of different proportions. Nay, it is self-evident, that gold and silver, which are dissolvable by all these matters, are collected in such a regulus when they have been first hidden in the ore. Besides, sulphur and arsenic are not always altogether absent. For they can hardly be expelled so perfectly by the many preceding roastings, but there remain some vestiges of them, which are not dissipated by a sudden melting, especially in a close vessel, wherein the flux swimming at top hinders the action of the air. Nay, arsenic is rather fixed by the black flux, and assumes a reguline semi-metallic form, while it is at the same time preserved from dissipating by the copper.

PROCESS VI.

To reduce black copper into pure copper by scorification.

"Separate a specimen of your black copper, of the weight of two small docimastical centners at least; and do it in the same manner, and with the same precautions, as if you would detect a quantity of silver in black copper.

"Then with lute and coal-dust make a bed in the cavity of a test moistened: when this bed is dry, put it under the muffle of the docimastical furnace, in the open orifice of which there must be bright burning coals, wherewith the test must likewise be surrounded on all parts. When the whole is perfectly red-hot, put your copper into the fire, alone, if it contains lead; but if it is altogether destitute of it, add a small quantity of glass of lead, and with a pair of hand-bellows increase the fire, that the whole may melt with all speed: this done, let the fire be made a little violent, and such as will suffice to keep the metallic mass well melted, and not much greater. The melted mass will boil, and scorias will be produced, that will gather at the circumference. All the heterogeneous matters being at last partly dissipated, and partly turned to scorias, the surface of the pure melted copper will appear. So soon as you see it, take the pot out of the fire, and extinguish it in water: then examine it in a balance; and if lead has been at first mixed with your black copper, add to the regulus remaining of the pure copper one 15th part of its weight which the copper has lost by means of the lead, then break it with a vice; and thus you will be able to judge by its colour and malleability, and by the surface of it after it is broken, whether the purifying of it has been well performed or no. But whatever caution you may use in the performing of this process, the product will neverthless be always less in proportion than what you can get by a greater operation, provided the copper be well purified in the small trial.

"*Remarks.* This is the last purifying of copper, whereby the separation of the heterogeneous bodies begun in the foregoing process is completed as perfectly as it possibly can be. For, except gold and silver, all the other metals and semimetals are partly dissipated and partly burnt, together with the sulphur and arsenic. For in the fusion they either turn of themselves to scoria or fumes, or this is perfomed by means of iron,

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iron, which chiefly absorbs semimetals, sulphur, and arsenic, and the destruction of it is at the same time accelerated by them. Thus the copper is precipitated out of them pure; for it is self-evident, that the unmetallic earth is expelled, the copper being reduced from a vitrescent terrestrial to a metallic state, and the arsenic being dissipated by means of which the said earth has been joined to the coarser reguluses of the first fusion. But there is at the same time a good quantity of the copper that gets into the scorias: however, a great part of it may be reduced out of them by repeating the fusion.

"The fire in this process must be applied with all imaginable speed, to make it soon run: for if you neglect this, much of your copper is burnt; because copper that is only red-hot, cleaves much sooner, and in much greater quantity, into half-scorified scales, than it is diminished in the same time when melted. However, too impetuous a fire, and one much greater than is necessary for the fusion of it, destroys a much greater quantity of it than a fire sufficient only to put it in fusion would do. For this reason, when the purifying is finished, the body melted must be extinguished in water together with the vessel, lest, being already grown hard, it should still remain hot for a while; which must be done very carefully to prevent dangerous explosions.

"The scoria of the above process frequently contains copper. To extract which, let two or three docimastical centners of the scoria, if it be charged with sulphur, be beat to a subtile powder, and mix it, either alone, or, if its refractory nature requires it, with some very fusible common pounded glass without a reducing saline flux, and melt it in a close vessel, and in a fire having a draught of air; by which you will obtain a regulus.

"But when the scoria has little or no sulphur at all in it, take one centner of it, and with the black flux manage it as you do the fusible copper ore, (process I.) by which you will have a pure regulus."

PROCESS VII.

The following process is translated from Mr Gellert's *Elements of Essaying*, and describes a new method of essaying ores, concerning which, see the section *Of Essaying in general*, p. 338. col. 2.

To essay copper ores.

Roast a quintal of ore [in the manner described in process IV.]: add to it an equal quantity of borax, half a quintal of fusible glass, and a quarter of a quintal of pitch: put the mixture in a crucible the inner surface of which has been previously rubbed with a fluid paste of charcoal dust and water: cover the whole with pounded glass mixed with a little borax, or with decrepitated sea-salt: put a lid on the crucible, which you will place in an air-furnace, or in a blast-furnace: when the fire shall have extended to the bottom of the coals, let it be excited briskly during half an hour, that the crucible may be of a brisk red colour: then withdraw the crucible, and when it is cold break it: observe if the scoria be well made: separate the regulus, which ought to be semi-ductile; and weigh it. This regulus is black copper; which must be purified, as in process VI.

If the ore be very poor, and inveloped in much earthy and stony matters; to a quintal of it, a quintal and a half of borax, a quarter of a quintal of pitch, and ten pounds of calx of lead or minium, must be added. The calx of lead will be revived, and will unite with the scattered particles of the copper, and together with these will fall to the bottom of the crucible, forming a compound regulus. When the ores of copper are very rich, half a quintal of borax and a quarter of a quintal of glass will be sufficient for the reduction. If the ore is charged with much antimony, a half or three quarters of a quintal of clean iron-filings may be added; otherwise the large quantity of antimony might destroy the copper, especially if the ore contained no lead. If iron be contained in copper ore, as in pyrites, some pounds of antimony, or of its regulus, may be added in the essay; as these substances more readily unite with iron than with copper, and therefore disengage the latter metal from the former.

PROCESS VIII.

To essay ores of copper by humid solution.

Some pyrites and ores contain so small a quantity of copper, that it cannot be separated by the above processes, but is destroyed by the repeated roastings and fusions. These, and indeed any copper-ores, may be essayed by humid solution, or by menstruums.

1. By roasting a sulphureous ore, the sulphur is burnt or decomposed, its phlogiston with part of the acid evaporating, while the remaining part of the acid combines with the metals, especially with the copper and iron contained in the ore. Accordingly, from an ore thus roasted, a vitriolic solution may be obtained by lixiviation with warm water, especially if the ore has been exposed, during a few days after it has been roasted, to a moist air; as the water thus gradually applied unites better with the combination of the metallic calxes with the concentrated vitriolic acid of the sulphur: but all the copper is not thus reduced by one operation to a vitriol. More sulphur must therefore be combined with the residuous ore by fusion, and must be again burnt off, that the remaining part of the copper may be attacked by some of the acid of the sulphur. By repeating this operation, almost all the copper and iron will be reduced to a vitriolic lixivium, from which the copper may be separated and precipitated by adding clean pieces of iron.

2. Copper-ores may be more easily essayed by humid solution in the following manner:

Roast the mineralised ores in the manner directed in Process IV. and pulverise them. If the ores be calciform, they do not require a previous roasting. Put this powder into a matrass capable of containing ten times the quantity of the ore; pour upon the ore some water: set the matrass in a sand-bath, that the water may boil: pour off the lixivium: add to the residuous ore more water, with some vitriolic or marine acid: digest as before in the sand-bath, and add this lixivium to the former: repeat this operation, till you find that the acid liquor dissolves no more metal.

By adding clean plates of iron you may precipitate the copper, which ought then to be collected, fused with a little borax and charcoal dust, and weighed.

Essaying of Ores of Copper.

We may remark, that although copper is not soluble by a dilute vitriolic acid, yet the calx of it obtained by roasting the ore, and also the calciform ores, are readily soluble in that acid.

3 Stahl advises to essay copper-ores by boiling them, after they have been roasted and powdered, in water, together with tartar and common salt, or with alum and common salt: but we have not found this method so effectual as the preceding.

PROCESS IX.

Dr Fordyce's method of essaying copper ores, by means of aqua regia. [Phil. Transf. for 1781, vol. lxxx. art. 3.]

This method consists only in pouring a quantity of an aqua regia composed of equal parts of the nitrous and muriatic acids upon a small quantity of the ore in powder, till a fresh affusion of the menstruum shows no green or blue tinge; by which means all the metalline part of the ore will be dissolved. It is then to be precipitated by means of a solution of fixed alkali, or volatile alkali cautiously managed will answer the same purpose. The metal then appears in form of a green precipitate called *green verditer;* but is mixed with what calcareous earth might have been contained in the ore; which the acids would dissolve, and the fixed alkali, if that kind was used, would precipitate. The caustic volatile alkali would not throw down this earth, and is therefore to be preferred to any other; but care must be taken to hit the point of saturation very exactly with it, as it violently dissolves the metal if added in too great quantity. Dr Fordyce orders this green calx to be dissolved in vitriolic acid, and then, by adding a piece of clean iron to the solution, all the copper contained in the ore will be obtained in its metallic form.

This method can be subject to no fallacy, unless the ore contains a luminous matter; in which case some of the earth of alum will be mixed with the metal, as that earth will be precipitated by fixed alkali, by caustic volatile alkali, and by iron. This, however, may very effectually be prevented by dissolving the green calx first in volatile alkali, and then in vitriolic acid. It is even probable, that by reducing the ore to a very fine powder, and treating it with caustic alkali, all the metal might be separated from the ore, without the trouble of using aqua regia. For the principles on which this method is conducted, see the article CHEMISTRY *passim.*

Ores of Lead

SECT. V. *Ores of Lead.*

§ 1. LEAD is seldom found native (E) and malleable. Neither, says Mr Macquer (F), is it found in form of calx or precipitate, as copper is, because it is much less liable to lose its phlogiston by the action of air and water: therefore almost all lead is found naturally mineralised.

Lead is generally mineralised by sulphur (G). Its ores have a dark white, but a shining metallic colour. These ores, although they form irregular masses, are internally regularly disposed, and seem to be composed of cubes of different sizes applied to each other, but not adherent. These ores are generally distinguished by the name of *Galena.* They commonly contain about three quarters of lead and a quarter of sulphur. They are accordingly heavy and fusible, although much less so than pure lead.

Most lead-ores contain silver; none but those of Willach in Corinthia are known to be quite free from it: some of them contain so much of it, that they are considered as improper ores of silver. The smaller the cubes of galena are, the larger quantity of silver has been remarked to be generally contained.

§ 2. *Lead ores may be essayed,* 1. By means of the black flux, in the manner directed by Mr Cramer, as follows:

"Let one or more quintals of this ore be grossly powdered, and roasted in a test till no more sulphureous vapours be exhaled, and then reduced to a finer powder; it is then to be accurately mixed with twice its weight of black flux, a fourth part of its weight of clean filings of iron and of borax. The mixture is to be put into a good crucible, or rather into a test: it is then to be covered with a thickness of two or three fingers of decrepitated sea-salt; the crucible is to be closed, and placed in a melting furnace, which is to be filled with unlighted charcoal, so that the top of the crucible shall be covered with it. Lighted coals are then to be thrown upon the unkindled charcoal, and the whole is left to kindle slowly, till the crucible be red-hot; soon after which a hissing noise proceeds from the crucible, which is occasioned by the reduction of the lead: the same degree of fire is to be maintained while this noise continues, and is afterwards to be suddenly

(E) Cronstedt doubts whether any native lead has been found. Linnæus says, he has seen what externally appeared to be such.

(F) But he is mistaken. As lead unites strongly with vitriolic acid, we might expect to meet ochres of this metal as well as of copper. Accordingly, we find some calciform ores of lead. 1. A pure calx of lead, in form of a friable ochre, *cerussa nativa,* found on the surface of galena; or it is indurated with a radiated or fibrous texture, of a white or yellowish green colour, and resembling spar; it is called *spatum plumbi, sparry lead-ore,* and *lead-spar.* 2. A calx of lead is found mixed with calx of arsenic, forming the ore called *arsenicated lead spar.* Sometimes also that calx is mixed with calcareous earth.

(G.) Lead is mineralised, 1. With sulphur; such are the several kinds of steel-grained and tessellated galenas, which also contain generally some silver. 2. With sulphurated iron and silver. It is fine-grained or tessellated, and is distinguished from the former by yielding a black slag when scorified, whereas the former yields a yellow slag. 3. With sulphurated antimony and silver. *Plumbum stibiatum Linnæi.* Its colour is similar to that of galena, and its texture is striated. 4. With sulphur and arsenic. This ore is soft, almost malleable, like lead. From this ore lead may be melted by the flame of a candle.

Ores of Tin denly increafed, fo as to make a perfect fufion; in which ftate it is to be continued during a quarter of an hour; after which it is to be extinguifhed; and the operation is then finifhed." The filings of iron are added to the mixture to abforb the fulphur; a certain quantity of which generally remains united with the lead-ore, notwithftanding the roafting. We need not fear left this metal fhould unite with the lead and alter its purity; becaufe, although the fulphur fhould not hinder it, thefe two metals cannot be united. The refractory quality of the iron does not impede the fufion; for the union it forms with the fulphur renders it fo fufible, that it becomes itfelf a kind of flux. This addition of iron in the effay of lead-ores would be ufelefs, if the ores were fufficiently roafted, fo that no fulphur fhould remain.

Or, 2. By the following procefs of Mr Gellert.

"Mix a quintal of roafted lead-ore with a quintal of calcined borax, half a quintal of glafs finely pulverifed, a quarter of a quintal of pitch, and as much of clean iron-filings: put this mixture into a crucible wetted with charcoal-duft and water: place the crucible before the nozzle of the bellows of a forge, and when it is red raife the fire during 15 or 20 minutes; then withdraw the crucible, and break it when cold."

Some very fufible ores, fuch as the galena of Derbyfhire, may be effayed, as large quantities of it are fmelted, without previous roafting, and without addition, merely by fufion during a certain time. For this purpofe nothing more is requifite than to keep the ore melted in a crucible with a moderate heat, till all the fulphur is deftroyed, and the metal be collected. To prevent the deftruction of any part of the metal after it is feparated from the fulphur, fome charcoal duft may be thrown over the ore, when put into the crucible; but if the galena be mixed with pyrites, efpecially arfenical pyrites, it requires much roafting and faline fluxes.

Sect. VI. *Tin Ores.*

§ 1. Tin is very feldom found pure, but almoft always mineralifed, and chiefly by arfenic.

The richeft ore of tin is of an irregular form, of a black or tarnifhed colour, and almoft the heavieft of all ores. The caufe of this extraordinary weight is, that it contains much more arfenic than fulphur, whereas moft ores contain more fulphur than arfenic.

The moft common tin ore is of the colour of ruft, which proceeds from a quantity of iron or of iron-ore mixed with it. The tin-ores of Saxony and Bohemia appear to be all of this kind.

One kind of tin-ore is femi-tranfparent and like fpar. Laftly, feveral kinds of garnets are enumerated by mineralogifts among tin-ores, becaufe they actually contain tin.

The county of Cornwall, in England, is very rich in tin-ores; and the tin contained in them is very pure. From tin-mines in the Eaft Indies tin is brought, called *Malacca tin*. No mines of tin have been difcovered in France; only in Bretagne garnets are found which contain fome tin.

Native tin is faid to have been found in Saxony and Malacca. Its ores are all of the calciform kind, excepting black-lead, which appears to be tin mineralifed by fulphur and iron.

The calciform ores of tin are, 1. Tin-ftone, which is of a blackifh-brown colour, and of no determinate figure; and tin-grains, or cryftals of tin, which refemble garnets, and are of a fpherical or polygonal figure, which they have probably acquired by the attrition of their angles. The tin-ftone feems to confift of attrited tin-grains. This ore is calx of tin united with calx of arfenic, and frequently with calx of iron. 2. Garnets are faid to contain calx of tin united with calx of iron. 3. Manganefe is faid alfo to contain tin.

§ 2. *Ores of tin may be effayed* in the fame manner, according to Cramer, as he directed for the effay of lead-ores, *fupra*. He further makes upon this effay the following remarks.

1. Tin-ore, on account of its greater gravity, admits better of being feparated, by elutriation or wafhing, from earths, ftones, and lighter ores. 2. A moft exact feparation of earths and ftones ought to be made, becaufe the fcorification of thefe by fluxes require fuch a heat as would deftroy the reduced tin. 3. The iron ought to be feparated by a magnet. 4. By a previous roafting, the arfenic is diffipated, which would otherwife carry off a great deal of tin along with it in a melting heat, would change another part of it into afhes, and would vitiate the remaining tin. 5. The effay of tin is very precarious and uncertain; becaufe tin once reduced is eafily deftructible by the fire, and by the faline fluxes requifite for the reduction.

Mr Gellert directs, that ores of tin fhould be effayed in the following manner:

"Mix a quintal of tin-ore, wafhed, pulverifed, and twice roafted, with half a quintal of calcined borax, and half a quintal of pulverifed pitch: thefe are to be put into a crucible moiftened with charcoal-duft and water, and the crucible placed in an air-furnace: after the pitch is burnt, give a violent fire during a quarter of an hour; and then withdraw your crucible. If the ore be not very well wafhed from the earthy matters, as it ought to be, a larger quantity of borax is requifite, with fome powdered glafs, by which the too quick fufion of the borax is retarded, and the precipitation of the earthy matters is prevented. If the ore contains iron, to the above mixture may be added fome alkaline falt.

Sect VII. *Ores of Iron.*

Ores of Iron § 1. Iron is feldom found in its metallic ftate, and free from admixture; though Cramer gives an account of an ore which needs only to be put into a forge, and heated to a welding heat. Several fands and earths alfo have the appearance of iron, and are even attractable by a magnet. The ore mentioned by Cramer is found vitrefied: with moderate blows the fcorias are thrown out, and a mafs of iron obtained, which, by being put into the forge again, gives tough iron without any other procefs. But in general this metal is found in the ftate of a calx; or, though it is combined with a great quantity of the principle of inflammability, it has feldom enough of the metallic form; and it is very often intermixed with a certain proportion of fulphur. The minerals wrought for iron are three, *viz.* iron-ore, iron-ftone, and bog-ore.

 The

Ores of Iron

The iron ore is found in veins as the ores of other metals are, and the appearance is very various; sometimes it has a rusty iron colour resembling that of iron; sometimes it has a reddish cast; often it is formed into a sort of crystallizations which are protuberant knobs on the outside; and these consist of fibres tending to a common centre: and it is of a dark colour like coagulated blood. It is called *hæmatites* or *blood-stone;* and consists of a calx of iron with a small quantity of vitriolic acid.

Iron-stone in this country is clay found in strata with coal; but which contains a large quantity of iron, so as to make the working profitable. Sometimes it has little appearance of iron; but when burnt with a certain degree of heat, it becomes of a deep red.

The bog-ore is an ochre of iron, and is found generally in low situations, and in springs containing a small quantity of iron, which flowing over these grounds deposits it in the form of ochre; and after a number of ages it proves a rich mine of iron, and it is extracted from a calx of this kind in many parts of the world. There is also a particular kind of spar found in different countries of a pale blue colour, so that from its first appearance we would expect copper; but it contains a small quantity of iron, and is a combination of the metal with inflammable matter, as in Prussian blue.

The loadstone is a noted iron ore. It is always found in veins, and it is alleged that it is only possessed of its magnetic qualities when near the surface. In appearance, it does not differ from many of the ores of iron, and treated as an ore, it affords a considerable quantity of metal.

Neither is iron generally mineralised so distinctly as other metals are, unless in pyrites and ores of other metals.

Most of the minerals called *iron ores* have an earthy, rusty, yellowish, or brownish appearance, which proceeds from the facility with which the true iron ores are decomposed.

Iron is the most common and most abundant of all metals. In Europe, at least, we cannot find an earth, a sand, a chalk, a clay, a vitrifiable or calcinable stone, or even the ashes of any substance, which do not contain an earth convertible into iron. All earths and stones which are naturally yellow or red, and all those which acquire these colours by calcination, receive them from the ferruginous earth mixed with them. The yellow and red ochres consist almost solely of this earth: the black and heavy sands are generally very ferruginous.

The iron ore most commonly found is a stone of the colour of rust, of an intermediate weight betwixt those of ores in general and of unmetallic stones. This ore has no determinate form, and easily furnishes an iron of good quality.

Blood-stone or hematites, sanguine or red-chalk, and emery, are iron ores; some of which, for instance blood-stone, are almost all iron. Most of these substances require but a slight calcination to be rendered very attractable by a magnet, and soluble in aquafortis; but the iron obtained from them is of a bad quality, and they are therefore neglected. Iron from the hematites is very brittle; that obtained from ochres is red-short. All these iron ores are so refractory, that they can scarcely be fused.

Essaying Ores of Iron

Iron ores are very various in their form; or rather they have no determinate form. Sometimes they are earths, sometimes stones, sometimes grains. Accordingly, those naturalists who attend only to the external form of things in classing and subdividing minerals, have been obliged to multiply the names of iron ores: hence they are called *iron ores in form of pease, of beans, of coriander seeds, of pepper-corns, of cinnamon,* &c. which Mr Cramer treats as ridiculous trifles.

§ 2. *Ores of iron may be essayed* by the following process:

PROCESS I.

[*Cramer's Art of Assaying*, Proc. 54.]

To reduce a precipitate iron out of its ore in a close vessel.

"Roast for a few minutes in a test under a muffle, and with a pretty strong fire, two centners of the small weight of your iron ore grossly pulverised; that the volatiles may be dissipated in part, and the ore itself be softened in case it should be too hard. When it is grown cold, beat it extremely fine, and roast it a second time, as you do the copper-ore, but in a much stronger fire, till it no longer emits any smell; then let it grow cold again. Compose a flux of three parts of the white flux, with one part of fusible pulverised glass, or of the like sterile unsulphureous scorias, and add sandiver and coal-dust, of each one-half part; add of this flux three times the quantity of your roasted ore, and mix the whole very well together; then choose a very good crucible, well rubbed with lute within, to stop the pores that may be here and there unseen; put into it the ore mixed with the flux; cover it over with common salt; and shut it close with a tile, and with lute applied to the points.

"Put the wind-furnace upon its bottom-part, having a bed made of coal-dust. Introduce besides into the furnace a small grate supported on its iron bars, and a stone upon it, whereon the crucible may stand as on a support: surround the whole with hard coals, not very large, and light them at top. When the vessel begins to grow red, which is indicated by the common salt's ceasing to crackle, stop with gross lute the holes of the bottom part, except that in which the nozzle of the bellows is received: blow the fire, and excite it with great force, adding now and then fresh fuel, that the vessel may be never naked at top: having thus continued your fire in its full strength for three quarters of an hour, or for a whole hour, take next the vessel out of it, and strike several times the pavement upon which it is set, that the small grains of iron which happen to be dispersed may be collected into a regulus, which you will find after having broken the vessel.

"When the regulus is weighed, try its malleability: then make it red-hot; and when so, strike it with a hammer: if it bears the strokes of a hammer, both when red hot and when cold, and extends a little, you may pronounce your iron very good; but if, when either

Essaying of Ores of Iron

either hot or cold, it proves brittle, you may judge it to be not quite pure, but still in a semi mineral condition.

" *Remarks.* The arsenic, but especially the sulphur, must be dissipated by roasting: for the former renders the iron brittle; and the latter not only does the same, but, being managed in a close vessel, with a saline alkaline flux, turns to a liver of sulphur; to the action of which iron yielding in every respect, it can upon no account be precipitated; and if not the whole, a great part of it at least is retained by the sulphureous scoria; so that in this case you commonly in vain look for a regulus.

" The iron obtained from this first precipitation has hardly ever the requisite ductility, but is rather brittle: the reason of which is, that the sulphur and arsenic remain in it; for notwithstanding that the greatest part of these is dissipated by roasting, yet some part adheres so strictly, that it can never be separated but with absorbent, terrestrial, alkaline ingredients, that change the nature of the sulphur. For which reason, in larger operations, they add quicklime, or marble stones that turn into quicklime; which, while they absorb the said minerals, are, by it, and by help of the destroyed part of the iron, brought to a fusion, and turn to a vitrified scoria; although, at other times, they resist so much by their own nature a vitrification. Another cause of the brittleness of iron is the unmetallic earth, when it is not yet separated from it; for the iron ore contains a great quantity of it, and in the melting remains joined with the reguline part: whence the iron is rendered very coarse and brittle. Some iron ores are altogether untractable: nevertheless, the reguluses produced out of them, when broken, have sometimes a neat semimetallic look; which proceeds undoubtedly from a mixture of a small quantity of some other metal or semimetal."

PROCESS II.

[The following Process for essaying iron ores, and ferruginous stones and earths, is extracted from Mr Gellert's *Elements of Essaying.*]

" Roast two quintals of iron ore, or of ferruginous earth: divide the roasted matter into two equal parts: to each of which add half a quintal of pulverised glass, if the substance be fusible and contain much metal; but if otherwise, add also half a quintal of calcined borax. If the roasting has entirely disengaged the sulphur and arsenic, an eighth part, or even half a quintal, of quicklime may be added. With the above matters mix twelve pounds of charcoal-powder.

" Take a crucible, and cover the bottom and sides of its inner surface with a paste made of three parts of charcoal-dust and one part of clay beat together. In the hollow left in this paste put the above mixture; press it lightly down; cover it with pulverised glass; and put on the lid of the crucible.

" Place two such crucibles at the distance of about four fingers from the air-pipe, in such a manner that the air shall pass betwixt them at about the third part of the height from the bottom: fill the space betwixt the two crucibles with coals of a moderate size; throw lighted coals upon them, that the fire may descend and make them red-hot from top to bottom: at first let the bellows blow softly, and afterwards strongly during an hour, or an hour and a quarter: then take away the crucible, and break it when cold. A regulus will be found in the bottom, and sometimes some small grains of iron in the scoria, which must be separated and weighed along with the regulus: then try the regulus whether it can be extended under the hammer, when hot and when cold.

" *Remarks.* To disengage a metal from the earthy matters mixed with it by fire, we must change these matters into scoria or glass. This change may be effected by adding some substance capable of dissolving these matters; that is, of converting them into a scoria or glass, from which the metallic matters may, by their weight, separate and form a regulus at bottom. Fixed alkali, which is an ingredient of the black and of the white flux, is a powerful solvent of earths and stones: but the alkali does also dissolve iron, especially when this is in a calcined or earthy state; and this solution is so much more complete, as the fire is longer applied. Hence, in ordinary essays, where an alkaline salt is used, little or no regulus of iron is obtained. Now, glass acts upon and dissolves earths and stones; but not, or very little, iron: consequently glass is the best flux for such essays, and experience confirms this assertion. If the ore contains but little iron, we may also add to the glass some borax; but borax cannot be employed singly, because it very soon fuses, and separates from the ore before the metal is revived. Quicklime is added, not only to absorb the sulphur and arsenic remaining in the ore, but also because it dissolves and vitrifies the stony and earthy matters of iron ores, which are generally argillaceous. For which reason, in the large operations for smelting iron ore, quicklime, and even in certain cases gypsum, are commonly added to facilitate the fusion.

" The reduction of iron-ore, and even the fusion of iron, requires a violent and long-continued heat: therefore, in this operation, we must not employ an inflammable substance, as pitch, that is soon consumed, but charcoal pulverised, which in close vessels is not sensibly wasted. Too much charcoal must not be added, else it will prevent the action of the glass upon the earthy matter of the ore, and consequently the separation of the metallic part. Experiments have taught me, that one part of charcoal-dust to eight parts of oar was the best proportion.

" When iron is surrounded by charcoal, it is not decomposed or destroyed; hence the iron of the ore, which sinks into the hollow made of paste of charcoal-dust and clay, remains there unhurt. The clay is added in this paste to render it more compact, and to keep the fluid iron collected together.

" The air is directed betwixt the crucibles; because if it was thrown directly upon them, they would scarcely be able to resist the heat. The space betwixt the air-pipe and the crucibles ought to be constantly filled with charcoal, to prevent the cold air from touching the crucibles. Ductile and malleable iron is seldom obtained in this first operation. The sulphur and arsenic, and frequently also an earthy matter adhering to the iron, prevent these qualities."

Effaying of Ores of Mercury.

Sect. VIII. *Ores of Mercury.*

§ 1. Mercury is fometimes found pure, fluid, and in its proper metallic ftate, only mixed with earths and ftones. Such are the ores of mercury found near Montpelier, in Tufcany, and in other places.

But the largeft quantity of the mercury found in the earth is mineralifed by fulphur, and confequently is in the form of cinnabar.

Mercury is never mineralifed by arfenic. The richeft mine of mercury is that of Almaden, in Spain.

Linnæus and Cronftedt mention a fingular ore, in which the mercury is *mineralifed by fulphur and by copper*. It is faid to be of a blackifh-grey colour, of a glaffy texture, and brittle. When the mercury and fulphur are expelled by fire, the copper is difcovered by giving an opake red colour to glafs of borax, which, by continuance and increafe of heat, becomes green and tranfparent.

§ 2. Cramer directs, that *ores of mercury fhould be effayed* by the following proceffes:

PROCESS I.

To feparate mercury out of an unfulphureous ore by diftillation.

"Take a lump of the pulverifed ore, one common pound, which muft ftand for one centner: put it into a glafs retort perfectly clean, well loricated, or coated up to half the length of its neck: this muft be very long, and turned backwards with fuch a declivity, that a glafs recipient may be perpendicularly applied to it: but you muft choofe a retort fmall enough, that the belly of it may be filled hardly two-thirds with the ore: this retort muft be placed fo, that nothing of the fluid adherent to the neck of it may fall into the cavity of the belly, but that the whole may run forward into the recipient. Finally, have a fmall recipient full of cold water: let it be perpendicularly fituated, and receive the neck of the retort in fuch manner that the extremity of it be hardly one half-inch immerfed into the water.

"Let the retort be furrounded with hot burning coals placed at fome diftance in form of a circle, left the veffel fhould burft by too fudden a heat: then by degrees bring the burning coals nearer and nearer, and at laft furround the whole retort with them and with frefh charcoal, that it may grow flightly red-hot; this fire having been continued for an hour let the retort cool of itfelf; then ftrike the neck of it gently, that the large drops which are always adherent to it may fall into the recipient: let the recipient be taken away, and the water feparated from the mercury by filtration, and let the mercury be weighed. This operation may be more conveniently performed in a fand-bath; in which cafe the pot containing the fand muft be middling red-hot, and the retort be able to touch the bottom of it immediately; nor is it then neceffary that the retort be loricated."

PROCESS II.

To revive mercury from a fulphureous cinnabar-ore.

"Beat your ore extremely fine, and mix it exactly with an equal portion of iron-filings, not rufty; proceed to diftil it with the fame apparatus as in the former procefs, but urge it with the ftrongeft fire that can be made.

Ores of Antimony.

"Cinnabar may be feparated from ftones by fublimation thus: Beat it to a fine powder, and put it into a fmall narrow glafs or earthen cucurbit, the belly of which it muft not fill more than one-third part: ftop the orifice at top; this muft be very narrow, to hinder the free action of the air. Put this fmall cucurbit in an earthen pot above too inches wide in diameter, and gather fand around this pot about as high as the pulverifed ore rifes in the cucurbit. Then put it upon burning coals in fuch manner that the bottom of the pot may be middling red-hot. Thus will your cinnabar afcend and form a folid ponderous ring, which muft be got out by breaking the veffel."

Sect. IX. *Ore of the Regulus of Antimony.*

Native regulus of antimony was firft obferved by Mr Swab, in Sweden, in the mine of Salberg, and defcribed by him in the memoirs of the Swedifh Academy in 1749 Mr Wallerius mentions it in his Mineralogy.

Regulus of antimony is generally united with fulphur, with which it forms antimony, which ought to be confidered as a true ore of the regulus of antimony.

Another ore of regulus of antimony is alfo known, of a red colour, in which the regulus is mineralifed both by arfenic and by fulphur. This ore refembles fome iron ores, and fome kinds of blend. It is diftinguifhed by its great fufibility, which is fuch, that it may be eafily melted by the flame of a candle.

The *native regulus* of antimony, by Von Swab, is faid by that author to have differed from the regulus of antimony obtained from ores, in thefe two properties, that it was capable of being eafily amalgamated with mercury, and that its calx fhot into cryftals during the cooling

Befides the ores of regulus of antimony enumerated above, this femimetal is alfo found in ores of other metallic fubftances, as in the *plumofe filver-ore*, and in the *ftibiated lead-ore*.

§ 2. The *ores of antimony may be effayed* by the following proceffes defcribed by Mr Cramer.

PROCESS I

To obtain antimony from its ore.

"Choose a melting crucible, or an earthen pot not glazed, that may contain fome common pounds of the ore of antimony, broken into fmall bits. Bore at the bottom of the crucible fome fmall holes, two lines in diameter. Let the bottom of the veffel be received by the orifice of a fmaller one, upon which it muft be put; and when the ore is put into it, let it be covered with a tile, and all the joints be ftopped with lute.

"Put thefe veffels upon the pavement of a hearth, and put ftones all around them at the diftance of fix inches. Fill this intermediate fpace with afhes, fo high that the inferior pot be covered to the upper brim. Then put frefh and burning coals upon it, and with a pair of hand-bellows excite the fire, till the

Essaying the upper vessels grow red hot: take off the fire a quarter of an hour after; and when the vessels are grown cold, open them. You will find that the melted antimony has run through the holes made at the bottom of the upper vessel into the inferior one, where it is collected."

Ores of Antimony

PROCESS II.

To roast crude antimony, or its ore, with or without addition.

"CHOOSE an earthen, flat, low dish, not glazed; and if it cannot bear being made middling red-hot, cover it over with a coat of lute without. Spread it thinly over with crude antimony, or with its ore, beaten to a pretty coarse powder, not exceeding a few ounces at once. Put the dish upon a fire-pan, having a few burning coals in it: increase the fire till it begins to smoke a little. Meanwhile you must incessantly move the powder with a piece of new tobacco-pipe; for this causes the sulphur to evaporate the sooner. If you increase the fire a little too soon, the powder immediately gathers into large clots, or even begins to melt. When this happens, take it immediately off the fire before it melts entirely. Then pulverise it again, and finally make a gentle fire under it. Your black shining powder will assume an ash colour almost like that of earth, and become more refractory in the fire; wherefore you may then increase the fire till your powder grows middling red-hot, and let it last till it ceases to smoke. If you add to your crude antimony pulverised, half or an equal quantity of charcoal-dust, and perform the rest as above, the roasting will be done more conveniently: for it does not gather so easily into clots, and melts with much greater difficulty. When part of the sulphur is evaporated, add some fat to it at several times. Thus you will sooner finish the operation, and the remaining calx will not be burnt to excess. However, if it be thus exposed to too violent and long-lasting a fire, a great quantity of it evaporates; nor does it cease entirely to smoke in a great fire. And it will be enough, if, growing middling red-hot, it does no longer emit the unpleasant smell of the acid of sulphur."

PROCESS III.

To reduce a calx of antimony into a semimetallic regulus.

"MIX some calx of antimony with a quarter part of the black flux, and put it into the crucible. Cover the vessel with a tile; make the fire as quickly as the vessel can bear it, but not greater than is necessary to melt the flux. When the whole has been well in fusion for half a quarter of an hour (which may be tried with a tobacco-pipe, taking off the tile), pour it into the melting cone, which must be warm and done over with tallow. Then immediately strike the cone several times. You will find, when the cone is inverted, a regulus, above which is a saline scoria."

The methods of *calcining antimony by means of nitre*, are described under CHEMISTRY, n 1252—1265; and those of obtaining a *regulus of antimony* without a previous calcination or roasting, by throwing a mixture of powdered antimony, tartar, and nitre, into a red-hot crucible, and by fusing this mixture, and of obtaining a *martial regulus of antimony*, are described at the article REGULUS.

Ores of Bismuth.

SECT. X. *Ores of Bismuth.*

§ 1. BISMUTH is found *native*, resembling the regulus of bismuth.

An *ochre* of bismuth, of a whitish yellow colour, is mentioned by Cronstedt; and is different from the ore improperly called *flowers of bismuth*, which is a calx of cobalt.

Bismuth is mineralised, 1. By *sulphur*. This ore has the appearance of galena. 2. With *sulphurated iron*. Bismuth is found also in cobalts, and in some ores of silver.

§ 2. *Ores of bismuth* may be *essayed* by the following process.

"Bismuth ore may be melted with the same apparatus as was directed for the fusion of crude antimony out of its ore. Or you may beat your ore to a very fine powder, with the black flux, sandiver, and common salt, in a close vessel, like the ore of lead or of tin, and melt it in a middling fire, having a draught of air. But as this semimetal is destructible and volatile, you must as quick as possible apply it to that degree of fire which the flux requires to be melted; and so soon as it is well melted, the vessel must be taken out of the fire; and when it is grown quite cold and broken, you will find your regulus."

Mr Gellert directs that ores of bismuth should be essayed by fusing a quintal of pulverised ore with half a quintal of calcined borax and half a quintal of pulverised glass, in order to vitrify the adherent earths and stones which envelope the bismuth. But probably the heat requisite for this vitrification would volatilise part of the bismuth.

If the ore be of the kinds above described, mineralised by sulphur, or by sulphur and iron, a previous roasting would be expedient, which may be performed in the same manner as is directed for the roasting of antimony.

SECT. XI. *Ores of the Regulus of Cobalt.*

COBALT is a grey-coloured mineral, with more or less of a metallic appearance. Its grain is close; it is compact and heavy, and frequently covered with an efflorescence of peach-coloured flowers. Of this several kinds are known †. All the true cobalts contain the semimetal called *regulus* of cobalt, the calx of which becomes blue by vitrification. This regulus is mineralised in cobalt by sulphur, and especially by a large quantity of arsenic. Some cobalts also contain bismuth and silver.

† See *Cobalt*.

Authors have given the name of *cobalt* to many minerals, although they do not contain the semimetal above mentioned, but only because they externally resemble the ore of the regulus of cobalt. But these minerals can only be considered as false cobalts. They are distinguishable from true cobalt by trying whether they can yield the blue glass called *smalt*, and the sympathetic ink. The red efflorescence is also a mark by which true cobalt is distinguishable from the

5 false:

Ores of Cobalt.

false: but this efflorescence only happens when the ore has been exposed to a moist air.

The principal mines of cobalt are in Saxony, where they are dug for the sake of obtaining zaffre, azure-blue or smalt, and arsenic. Very fine cobalt is also found in the Pyrenean mountains. It has been likewise found in Cornwall and Scotland. And that it is in the eastern parts of Asia, appears from the blue colouring on old oriental porcelain: but probably the mines discovered in these countries are nearly exhausted, as considerable quantities of zaffre and smalt are exported from Europe to China.

Cobalt is heavier than most other ores, from the large quantity of arsenic it contains; and in this respect it resembles the ore of tin.

Besides the grey or ash-coloured cobalt above described, which is the most frequent, other cobalts are found of various colours and textures, mixed with various substances. Wallerius enumerates six species of cobalts. 1. The *ash-coloured ore*, which is regulus of cobalt mineralised by arsenic, consisting of shining leaden-coloured grains. Some ores of this kind are compact resembling steel, and others are of a loose texture and friable. 2. The *specular ore* is black, shining like a mirror, and laminated. This species is very rare; and is supposed by Wallerius to be a foliated spar, or selenites mixed with cobalt. 3. The *vitreous* or *slag-like ore*, is of a bluish, shining colour, compact, or spongy. 4. *Crystallized ore*, is a grey, deep-coloured cobalt, consisting of clusters of cubical, pyramidal, prismatic crystals. 5. *Flowers of cobalt*, red, yellow, or violet. These flowers seem to be formed from some of the above-described compact ores, decomposed by exposure to moist air. This decomposition is similar to that which happens to ferruginous and cupreous pyrites. 6. The *earthy cobalt* is of a greenish white, or of a yellow colour, and of a soft and friable texture. This species seems to be an ochre of cobalt; and is formed perhaps from the flowers of cobalt further decomposed, in the same manner as a martial ochre is formed from the saline efflorescence of decomposing pyrites, when this efflorescence is further decomposed by exposure to moist air; by which the vitriolic acid contained in it is expelled, and the efflorescence is changed from a saline state to that of an ochre or calx.

Besides these proper ores, cobalt is also found in a blue clay along with native silver, in ores of bismuth, and in the mineral called *kupfernickel*. See Nickel.

The *essay* of cobalt is described at the article Regulus *of Cobalt*.

Sect. XII. *Ores of Zinc.*

§ 1. The proper ore of zinc is a substance which has rather an earthy or stony than metallic appearance, and is called *calamy*, *calamine*, or *lapis calaminaris*. This stone, although metallic, is but moderately heavy, and has not the brilliancy of most other ores. Its colour is yellow, and like that of rust. It is also less dense than other metallic minerals. It seems to be an ore naturally decomposed. The calamine is not worked directly to obtain zinc from it, because this would only succeed in close vessels, and consequently with small quantities, according to Mr Margraaf's process. But it is successfully employed for the conversion of copper into brass by cementation, by which the existence of zinc in that stone is sufficiently proved.

Ores of Zinc.

Mr Wallerius enumerates also amongst the ores of zinc a very compounded mineral, consisting of zinc, sulphur, iron, and arsenic. This mineral, called *blend*, resembles externally the ore of lead, and hence has been called *false galena*. These blends have different forms and colours; but are chiefly red, like the red ore of antimony.

Zinc is obtained from certain minerals in the East Indies, of which we know little.

Calciform ores of zinc, according to Cronstedt, are pure or mixed. The pure are indurated, and sometimes crystallised, resembling lead-spar. The mixed ore contains also some calx of iron. This is *calamine*. It is whitish, yellowish, reddish, or brown.

Zinc is *mineralised*, 1. By *sulphurated iron*. *Ore of zinc.* Wallerius says, lead is sometimes contained in this ore. It is white, blue, or brown. 2. By *sulphur, arsenic, and iron*. *Blend*, or *pseudo-galena*, or *false-galena*, or *black-jack*. These are of various colours, white, yellowish, brown, reddish, greenish, black. They consist of scales, or are tessellated Mr Cronstedt thinks, that in blends the zinc is mineralised in the state of a calx, and in the ore of zinc in its metallic state

§ 2. Although the minerals above enumerated have been known, from their property of converting copper into brass, to be ores of zinc, yet the method of essaying them so as to obtain the contained zinc was not known, or at least not published, before Mr Margraaf's Memoir of the Berlin Academy for the year 1746, upon that subject. That very able chemist has shown, that zinc may be obtained from its ores, from the flowers, or from any other calx of zinc, by treating these with charcoal-dust, in close vessels, to prevent the combustion of the zinc, which happens immediately upon its reduction when exposed to air. For this purpose, he put a quantity of finely powdered calamine, or roasted blend, or other calx of zinc, well mixed with an eighth part of charcoal-dust, into a strong, luted earthen retort, to which he fitted a receiver. Having placed his retort in a furnace and raised the fire, he applied a violent heat during two hours. When the vessels were cold and broken, he found the zinc in its metallic form adhering to the neck of the retort.

The chief difficulty in this operation is to get an earthen retort sufficiently compact to retain the vapour of the zinc (for it easily pervades the Hessian crucibles, Stourbridge melting-pots, and similar vessels, as may be seen from the quantity of flowers which appear upon their outer surface, when zinc or its calxes and any inflammable matter have been exposed to heat within these vessels), and at the same time sufficiently strong to resist the violent fire which Mr Margraaf requires.

A pretty exact essay of an ore of zinc may be made in the following manner:

Mix a quantity of pulverised roasted ore or calx of zinc with

Ores of Arsenic. with an eighth part of charcoal-duſt. Put this mixture into a crucible capable of containing thrice the quantity. Diffuſe equally amongſt this mixture a quantity of ſmall grains or thin plates of copper equal to that of the calamine or ore employed, and upon the whole lay another equal quantity of grains or plates of copper; and laſtly, cover this latter portion of copper with charcoal-duſt. Lute a lid upon the crucible, and apply a red heat during an hour or two. The copper or part of it will unite with the vapour of the zinc, and be thereby converted into braſs. By comparing the weight of all the metal after the operation with the weight of the copper employed, the weight acquired, and conſequently the quantity of zinc united with the copper, will be known. The copper which has not been converted into braſs, or more copper with freſh charcoal-duſt, may be again added in the ſame manner to the remaining ore, and the operation repeated with a heat ſomewhat more intenſe, that any zinc remaining in the ore may be thus extracted. A curious circumſtance is, that a much greater heat is required to obtain zinc from its ore by diſtillation, than in the operation now deſcribed of making braſs; in which the ſeparation of the zinc from its ore ſeems to be facilitated by its diſpoſition to unite with copper.

Sect. XIII. *Ores of Arſenic.*

§ 1. The minerals which contain the largeſt quantity of arſenic are cobalts and white pyrites; although it is alſo contained in other ores, it being one of the mineraliſing ſubſtances. But as cobalt muſt be roaſted to obtain the ſulphur it contains, the arſenic alſo which riſes during this torrefaction is collected, as we ſhall ſee in Part III. (Smelting of Ores), and the particular articles of each of the metallic ſubſtances mentioned in this article.

I. Regulus of arſenic is found native. It is of a leaden colour; it burns with a ſmall flame; and is diſſipated, leaving generally a very ſmall quantity of calx of biſmuth, or of calx of cobalt, and a very little ſilver. When it is of a ſolid and teſtaceous texture, it has been improperly called *teſtaceous cobalt*, in German *ſcherbencobalt*. II. Calx of arſenic is found in form of powder; native flowers of arſenic, or of indurated ſemitranſparent cryſtals; native cryſtalline arſenic. III. Calx of arſenic is mixed, 1. With ſulphur; when yellow, it is called *orpiment*; when red, it is called *native realgar*: the difference of colour depends on the proportion of the two component parts. 2. With calx of tin; tin-grains. 3. With ſulphur and ſilver, in the red ſilver ore. 4. With calx of lead, in the lead-ſpar. 5. With calx of cobalt, in the efflorеſcence of cobalt. IV. Arſenic is mineraliſed, 1. With ſulphurated iron; arſenical pyrites. 2. With iron only; white pyrites, or miſpickle. 3. With cobalt, in almoſt all cobalt-ores. 4. With ſilver. 5. With copper. 6. With antimony.

§ 2. Arſenic may be ſeparated from its ore or earthy matter with which it happens to be mixed, by ſublimation, according to the following proceſs by Mr Cramer.

"Do every thing as was ſaid about mercury, or ſulphur; but let the veſſel which is put into the fire with the ore in it be of earth or ſtone, and the recipient be of glaſs, and of a middling capacity. Nor is it neceſſary that this ſhould be filled with water, ſo it be but well luted. The fire muſt likewiſe be ſtronger, and continued longer than for the extracting of ſulphur. Nevertheleſs, every kind of arſenic cannot be extracted in a confined fire: for it adheres to the matrix more ſtrongly than ſulphur and mercury. You will find in the part of the veſſel which is more remote from the fire, pulverulent and ſubtle flowers of arſenic; but there will adhere to the poſterior of the neck of the retort ſmall ſolid maſſes, ſhining like ſmall cryſtals, tranſparent, ſometimes gathered into a ſolid ſublimate, and perfectly white, if the ore of the arſenic was perfectly pure; which nevertheleſs happens very ſeldom. The flowers are moſt commonly thin, and of a grey colour: which proceeds from the phlogiſton mixed with the maſs. They are often of a citron or of a golden colour, which is a ſign that there is in the mixture ſome mineral ſulphur; and if the ſublimate be red or yellow, it is a ſign of much ſulphur.

"As all the arſenic contained in the ore is not expelled in cloſe veſſels, you muſt weigh the reſiduum; then roaſt it in a crucible till it ſmokes no longer, or rather in an earthen flat veſſel not glazed, and in a ſtrong fire to be ſtirred now and then with a poker, and then weigh it when grown cold: you will be able thus to know how much arſenic remained in the cloſe veſſel, unleſs the ore contain biſmuth."

If the arſenic be ſulphurated, it may be purified by triturating it with mercury or with fixed alkali, and by ſubliming the arſenic from the remaining ſulphurated mercury or alkali. The method of obtaining a regulus of arſenic is deſcribed at the article *Regulus of Arſenic*.

PART III.

SMELTING of ORES.

Having ſhown the nature of the principal metallic minerals, and the ſubſtances of which they are compoſed; and alſo explained the proceſſes by which an exact analyſis of theſe compound minerals may be made, and the nature and quantity of the contained metals may be known; in order to complete what relates to this important ſubject, we ſhall deſcribe in this Part the principal operations by which metals, &c. are obtained "in the great," as it is called, or for commercial purpoſes. What we ſhall ſay upon this ſubject will chiefly be extracted from a *Treatiſe on the Smelting of Ores, by Schlutter*, tranſlated from the German into French by M. Hellot; becauſe this, of all the modern works upon that ſubject, appears to be the moſt exact. We ſhall firſt deſcribe the operations upon pyritous matters for the extraction of ſul-

Sulphur Works.

phur, &c. and afterwards the operations by which metallic fubftances are extracted from *ores* properly fo called.

Sect. I. *Extraction of Sulphur from Pyrites and other Minerals.*

In order to obtain fulphur from pyrites, this mineral ought to be expofed to a heat fufficient to fublime the fulphur, or to make it diftil in veffels, which muft be clofe, to prevent its burning.

Sulphur is extracted from pyrites at a work at Schwartzember, in Saxony, in the high country of the mines; and in Bohemia at a place called *Alten-Sattel.*

The furnaces employed for this operation are oblong, like vaulted galleries; and in the vaulted roofs are made feveral openings. Thefe are called *furnaces for extracting fulphur.*

In thefe furnaces are placed earthen-ware tubes, filled with pyrites broken into pieces of the fize of fmall nuts. Each of thefe tubes contains about 50 pounds of pyrites. They are placed in the furnace almoft horizontally, and have fcarcely more than an inch of defcent. The ends, which come out of the furnace five or fix inches, become gradually narrower. Within each tube is fixed a piece of baked earth, in form of a ftar, at the place where it begins to become narrower, in order to prevent the pyrites from falling out, or choaking the mouth of the tube. To each tube is fitted a receiver, covered with a leaden pipe, pierced with a fmall hole to give air to the fulphur. The other end of the tube is exactly clofed. A moderate fire is made with wood, and in eight hours the fulphur of the pyrites is found to have paffed into the receivers.

The refiduum of the pyrites, after the diftillation, is drawn out at the large end, and frefh pyrites is put in its place. From this refiduum, which is called *burnings of fulphur*, vitriol is extracted.

The 11 tubes, into which were put, at three feveral diftillations, in all nine quintals, or 900 pounds of pyrites, yield from 100 to 150 pounds of crude fulphur, which is fo impure as to require to be purified by a fecond diftillation.

This purification of crude fulphur is alfo done in a furnace in form of a gallery, in which five iron cucurbits are arranged on each fide. Thefe cucurbits are placed in a floping direction, and contain about eight quintals and a half of crude fulphur. To them are luted earthen tubes, fo difpofed as to anfwer the purpofe of capitals. The nofe of each of thefe tubes is inferted into an earthen pot called the *fore-runner.* This pot has three openings; namely that which receives the nofe of the tube; a fecond fmaller hole, which is left open to give air; and a third in its lower part, which is ftopped with a wooden peg.

When the preparations are made, a fire is lighted about feven o'clock in the evening, and is a little abated as foon as the fulphur begins to diftil. At three o'clock in the morning, the wooden pegs which ftop the lower holes of the fore-runners are for the firft time drawn out, and the fulphur flows out of each of them into an earthen pot with two handles, placed below for its reception. In this diftillation the fire muft be moderately and prudently conducted; otherwife lefs fulphur would be obtained, and it alfo would be of a grey colour, and not of the fine yellow which it ought to have when pure. The ordinary lofs in the purification of eight quintals of crude fulphur is, at moft, one quintal.

When all the fulphur has flowed out, and has cooled a little in the earthen pots, it is caft into moulds made of beech-tree, which have been previoufly dipt in water and fet to drain. As foon as the fulphur is cooled in the moulds, they are opened, and the cylinders of fulphur are taken out and put up in cafks. Thefe are called *roll-brimftone.*

As fulphur is not only in pyrites, but alfo in moft metallic minerals, it is evident that it might be obtained by works in the great from the different ores which contain much of it, and from which it muft be feparated previoufly to their fufion: but as fulphur is of little value, the trouble of collecting it from ores is feldom taken. Smelters are generally fatisfied with freeing their ores from it, by expofing them to a fire fufficient to expel it. This operation is called *torrefaction*, or *roafting of ores.*

There are, however, ores which contain fo much fulphur, that part of it is actually collected in the ordinary operation of roafting, without much trouble for that purpofe. Such is the ore of Ramelfberg in the country of Hartz.

This ore, which is of lead, containing filver, is partly very pure, and partly mixed with cupreous pyrites and filver; hence it is neceffary to roaft it.

The roafting is performed by laying alternate ftrata of ore and wood upon each other in an open field, taking care to diminifh the fize of the ftrata as they rife higher; fo that the whole mafs fhall be a quadrangular pyramid truncated above, whofe bafe is about 31 feet fquare. Below, fome paffages are left open, to give free entrance to the air; and the fides and top of the pyramid are covered over with fmall ore, to concentrate the heat and make it laft longer. In the centre of this pyramid there is a channel which defcends vertically from the top to the bafe. When all is properly arranged, ladlefuls of red-hot fcoria from the fmelting furnace are thrown down the channel, by which means the fhrubs and wood placed below for that purpofe are kindled, and the fire is from them communicated to all the wood of the pile, which continues burning till the third day. At that time the fulphur of the mineral becomes capable of burning fpontaneoufly, and of continuing the fire after the wood is confumed.

When this roafting has been continued 15 days, the mineral becomes greafy; that is, it is covered over with a kind of varnifh: 20 or 25 holes or hollows are then made in the upper-part of the pile in which the fulphur is collected. From thefe cavities the fulphur is taken out thrice every day, and thrown into water. This fulphur is not pure, but crude; and is therefore fent to the manufacturers of fulphur, to be purified in the manner above related.

As this ore of Ramelfberg is very fulphureous, the firft roafting, which we are now defcribing, lafts three months; and during this time, if much rain has not fallen, or if the operation has not failed by the pile falling

falling down or cracking, by which the air has so much free access, that the sulphur is burnt and consumed, from 10 to 20 quintals of crude sulphur are by this method collected.

The sulphur of this ore, like that of most others, was formerly neglected, till, in the year 1570, a person employed in the mines called *Christopher Sauder*, discovered the method of collecting it, nearly as it is done at present.

Metallic minerals are not the only substances from which sulphur is extracted. This matter is diffused in the earth in such quantities, that the metals cannot absorb it all. Some sulphur is found quite pure, and in different forms, principally in the neighbourhood of volcanoes, in caverns, and in mineral waters. Such are the opaque kind called *virgin-sulphur*; the transparent kind called *sulphur of Quito*; and the native flowers of sulphur, as those of the waters of Aix-la-Chapelle. It is also found mixed with different earths. Here we may observe, that all those kinds of sulphur which are not mineralised by metallic substances, are found near volcanoes, or hot mineral waters, and consequently in places where nature seems to have formed great subterranean laboratories, in which sulphureous minerals may be analysed and decomposed, and the sulphur separated, in the manner in which it is done in small in our works and laboratories. However that be, certainly one of the best and most famous sulphur-mines in the world is that called *Solfatara*. The Abbé Nollet has published, in the Memoirs of the Academy, some interesting observations upon this subject, which we shall here abridge.

Near Puzzoli, in Italy, is that great and famous mine of sulphur and alum called at present *Solfatara*. It is a small oval plain, the greatest diameter of which is about 400 yards, raised about 300 yards above the level of the sea. It is surrounded by high hills and great rocks, which fall to pieces, and whose fragments form very steep banks. Almost all the ground is bare and white, like marle; and is every-where sensibly warmer than the atmosphere in the greatest heat of summer, so that the feet of persons walking there are burnt through their shoes. It is impossible not to observe the sulphur there; for every-where may be perceived by the smell a sulphureous vapour, which rises to a considerable height, and gives reason to believe that there is a subterraneous fire below, from which that vapour proceeds.

Near the middle of this field there is a kind of bason three or four feet lower than the rest of the plain, in which a sound may be perceived when a person walks on it, as if there were under his feet some great cavity, the roof of which was very thin. After that, the lake Agnano is perceived, whose waters seem to boil. These waters are indeed hot, but not so hot as boiling water. This kind of ebullition proceeds from vapours which rise from the bottom of the lake, which being set in motion by the action of subterranean fires, have force enough to raise all that mass of water. Near this lake there are pits, not very deep, from which sulphureous vapours are exhaled. Persons who have the itch come to these pits, and receive the vapours in order to be cured. Finally, there are some deeper excavations, whence a soft stone is procured which yields sulphur. From these cavities vapours exhale, and issue out with noise, and which are nothing else than sulphur subliming through the crevices. This sulphur adheres to the sides of the rocks, where it forms enormous masses: in calm weather, the vapours may be evidently seen to rise 25 or 30 feet from the surface of the earth.

These vapours, attaching themselves to the sides of rocks, form enormous groups of sulphur, which sometimes fall down by their own weight, and render these places of dangerous access.

In entering the Solfatara, there are warehouses and buildings erected for the refining of sulphur.

Under a great shed, or hangar, supported by a wall behind, and open on the other three sides, the sulphur is procured by distillation from the soft stones we mentioned above. These stones are dug from under ground; and those which lie on the surface of the earth are neglected. These last are, however, covered with a sulphur ready formed, and of a yellow colour: but the workmen say they have lost their strength, and that the sulphur obtained from them is not of so good a quality as the sulphur obtained from the stones which are dug out of the ground.

These last mentioned are broken into lumps, and put into pots of earthen ware, containing each about 20 pints Paris measure. The mouths of these pots are as wide as their bottoms; but their bellies, or middle parts, are wider. They are covered with a lid of the same earth, well luted, and are arranged in two parallel lines along two brick walls, which form the two sides of a furnace. The pots are placed within these walls; so that the centre of each pot is in the centre of the thickness of the wall, and that one end of the pots overhangs the wall within, while the other end overhangs the wall without. In each furnace ten of these pots are placed; that is, five in each of the two walls which form the two sides of the furnace." Betwixt these walls there is a space of 15 or 18 inches; which space is covered by a vault resting on the two walls. The whole forms a furnace seven feet long, two feet and a half high, open at one end, and shut at the other, excepting a small chimney through which the smoke passes.

Each of these pots has a mouth in its upper part without the furnace, in order to admit a tube of 18 lines in diameter and a foot in length, which communicates with another pot of the same size placed without the building, and pierced with a round hole in its base of 15 or 18 lines diameter. Lastly, to each of these last-mentioned pots there is a wooden tub placed below, in a bench made for that purpose.

Four or five of these furnaces are built under one hangar, or shed. Fires are kindled in each of them at the same time; and they are thrown down after each distillation, either that the pots may be renewed, or that the residuums may be more easily taken out.

The fire being kindled in the furnace, heats the first pots containing the sulphureous stones. The sulphur rises in fumes into the upper part of the pot, whence it passes through the pipe of communication into the external vessel. There the vapours are condensed, become liquid, and flow through the hole below into the tub, from which the sulphur is easily turned out, because the form of the vessel is that of a truncated cone

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whose narrower end is placed below, and because the hoops of the tub are so fastened that they may be occasionally loosened. The mass of sulphur is then carried to the buildings mentioned before, where it is remelted for its purification, and cast into rolls, such as we receive it.

Extraction of VITRIOL *from pyrites.* See CHEMISTRY.

Extraction of ALUM *from pyritous substances and from aluminous earths.* See CHEMISTRY.

SECT II. *Smelting of Ores in general.*

§ 1 As ores consist of metallic matters combined with sulphur and arsenic, and are besides intermixed with earthy and stony substances of all kinds, the intention of all the operations upon these compound bodies is to separate these different substances from each other. This is effected by several operations founded on the known properties of those substances. We now proceed to give a general idea of these several operations.

First of all, the ore is to be separated from the earths and stones accidentally adherent to it; and when these foreign substances are in large masses, and are not very intimately mixed in small particles with the ore, this separation may be accomplished by mechanical means. This ought always to be the first operation, unless the adherent substance be capable of serving as a flux to the ore. If the unmetallic earths be intimately mixed with the ore, this must necessarily be broken and divided into small particles. This operation is performed by a machine which moves pestles, called *bocards* or *stampers*. After this operation, when the parts of the mineral are specifically heavier than those of the unmetallic earth or stone, these latter may be separated from the ore by washing in canals through which water flows. With regard to this washing of ores, it is necessary to observe, that it cannot succeed but when the ore is sensibly heavier than the foreign matters. But the contrary happens frequently, as well because quartz and spar are naturally very ponderous, as because the metallic matter is proportionally so much lighter as it is combined with more sulphur

When an ore happens to be of this kind, it is necessary to begin by roasting it, in order to deprive it of the greatest part of its sulphur.

It happens frequently that the pyritous matters accompanying the ore are so hard that they can scarcely be pounded. In this case it is necessary to roast it entirely, or partly, and to throw it red-hot into cold-water; by which the stones are split, and rendered much more capable of being pulverised

Thus it happens very frequently, that roasting is the first operation to which an ore is exposed.

When the substance of the ore is very fusible, this first operation may be dispensed with, and the matter may be immediately fused without any previous roasting, or at least with a very slight one. For, to effect this fusion, it is necessary that it retain a great quantity of its sulphur, which, with the other fluxes added, serves to destroy or convert into scoria a considerable part of the stony matter of the mineral, and to reduce the rest into a brittle substance, which is called the *matt of lead* or of *copper*, or other metal contained in the ore. This matt is therefore an intermediate matter betwixt the mineral and the metal; for the metal is there concentrated, and mixed with less useless matter than it was in the ore. But as this matt is always sulphureous, the metal which it contains cannot have its metallic properties. Therefore it must be roasted several times to evaporate the sulphur, before it is remelted, when the pure metal is required. This fusion of an ore not roasted, or but slightly roasted, is called *crude fusion*.

We may here observe upon the subject of washing and roasting of ores, that as arsenic is heavier than sulphur, and has nearly the weight of metals, the ores in which it prevails are generally very heavy, and consequently are susceptible of being washed, which is a great advantage. But on the other side, as arsenic is capable of volatilising, scorifying, and destroying many metals, these ores have disadvantages in the roasting and fusion, in both which considerable loss is caused by the arsenic. Some ores contain, besides arsenic, other volatile semimetals, such as antimony and zinc. These are almost untractable, and are therefore neglected. They are called *mineræ rapaces*, "rapacious ores."

When the metal has been freed as much as is possible from foreign matters by these preliminary operations, it is to be completely purified by fusions more or less frequently repeated; in which proper additions are made, either to absorb the rest of the sulphur and arsenic, or to complete the vitrification or scorification of the unmetallic stones and earth.

Lastly, as ores frequently contain several different metals, these are to be separated from each other by processes suited to the properties of these metals, of which we shall speak more particularly as we proceed in our examination of the ores of each metal.

§ 2. To facilitate the extraction of metallic substances from the ores and minerals containing them, some operations previous to the fusion or smelting of these ores and minerals are generally necessary. These operations consist of, 1. The *separation* of the ores and metallic matters from the adhering unmetallic earths and stones, by hammers and other mechanical instruments, and by washing with water. 2. Their *division* or reduction into smaller parts by contusion and trituration, that by another washing with water they may be more perfectly cleansed from extraneous matters, and rendered fitter for the subsequent operations, calcination or roasting, and fusion. 3. *Roasting* or *calcination*; the uses of which operation are, to expel the volatile, useless, or noxious substances, as water, vitriolic acid, sulphur, and arsenic; to render the ore more friable, and fitter for the subsequent contusion and fusion; and, lastly, to calcine and destroy the viler metals, for instance the iron of copper-ores, by means of the fire, and of the sulphur and arsenic. Stones, as quartz and flints, containing metallic veins or particles, are frequently made red-hot, and then extinguished in cold water, that they may be rendered sufficiently friable and pulverable, to allow the separation of the metallic particles.

Roasting is unnecessary for native metals; for some of the richer gold and silver ores; for some lead-ores, the

Roasting of Ores.

the sulphur of which may be separated during the fusion; and for many calciform ores, as these do not generally contain any sulphur and arsenic.

In the roasting of ores, the following attentions must be given, 1. To reduce the mineral previously into small lumps, that the surface may be increased; but they must not be so small, nor placed so compactly, as to prevent the passage of the air and flame. 2. The larger pieces must be placed at the bottom of the pile, where the greatest heat is. 3. The heat must be gradually applied, that the sulphur may not be melted, which would greatly retard its expulsion; and that the spars, fluors, and stones, intermixed with the ore, may not crack, fly, and be dispersed. 4. The ores not thoroughly roasted by one operation must be exposed to a second. 5. The fire may be increased towards the end, that the noxious matters more strongly adhering may be expelled. 6. Fuel which yields much flame, as wood and fossil coals free from sulphur, is said to be preferable to charcoal or coaks. Sometimes cold water is thrown on the calcined ore at the end of the operation, while the ore is yet hot, to render it more friable.

No general rule can be given concerning the duration or degree of the fire, these being very various according to the difference of the ores. A roasting during a few hours or days is sufficient for many ores; while some, such as the ore of Rammelsberg, require that it should be continued during several months.

Schlutter enumerates five methods of roasting ores. 1. By constructing a pile of ores and fuel placed in alternate strata, in the open air, without any furnace. 2. By confining such a pile within walls, but without a roof. 3. By placing the pile under a roof, without lateral walls. 4. By placing the pile in a furnace consisting of walls and a roof. 5. By roasting the ore in a reverberatory furnace, in which it must be continually stirred with an iron rod.

Several kinds of fusions of ores may be distinguished. 1. When a sulphureous ore is mixed with much earthy matter, from which it cannot be easily separated by mechanical operations, it is frequently melted, in order to disengage it from these earthy matters, and to concentrate its metallic contents. By this fusion, some of the sulphur is dissipated, and the ore is reduced to a state intermediate betwixt that of ore and of metal. It is then called a *matt (lapis sulphureo-metallicus)*; and is to be afterwards treated like a pure ore by the second kind of fusion, which is properly the smelting, or extraction of the metal by fusion. 2. By this fusion or smelting, the metal is extracted from the ore previously prepared by the above operations, if these be necessary. The ores of some very fusible metals, as of bismuth, may be smelted by applying a heat sufficient only to melt the metals, which are thereby separated from the adhering extraneous matters. This separation of metals by fusion, without the vitrification of extraneous matters, may be called *eliquation*. Generally, a complete fusion of the ore and vitrification of the earthy matters are necessary for the perfect separation of the contained metals. By this method, metals are obtained from their ores, sometimes pure, and sometimes mixed with other metallic substances, from which they must be afterwards separated; as we shall see when we treat of the extraction of particular metals. To procure this separation of metals from ores, these must be so thinly liquefied, that the small metallic particles may disengage themselves from the scoria; but it must not be so thin as to allow the metal to precipitate before it be perfectly disengaged from any adhering extraneous matter, or to pervade and destroy the containing vessels and furnace. Some ores are sufficiently fusible; but others require certain additions called *fluxes*, to promote their fusion and the vitrification of their unmetallic parts; and also to render the scoria sufficiently thin to allow the separation of the metallic particles.

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Different fluxes are suitable to different ores, according to the quality of the ore, and of the matrix, or stone adherent to it.

The matrixes of two different ores of the same metal frequently serve as fluxes to each other; as, for instance, an argillaceous matrix with one that is calcareous; these two earths being disposed to vitrification when mixed, though each of them is singly unfusible. For this reason, two or more different ores to be smelted are frequently mixed together.

The ores also of different metals require different fluxes. Thus calcareous earth is found to be best suited to iron-ores, and spars and scoria to fusible ores of copper.

The fluxes most frequently employed in the smelting of ores are, calcareous earths, fluors or vitreous spars, quartz, and sand, fusible stones, as slates, basaltes, the several kinds of scoria, and pyrites.

Calcareous earth is used to facilitate the fusion of ores of iron, and of some of the poorer ores of copper, and, in general, of ores mixed with argillaceous earths, or with feltspar. This earth has been sometimes added with a view of separating the sulphur, to which it very readily unites: but by this union the sulphur is detained, and a hepar is formed, which readily dissolves iron and other metals, and so firmly adheres to them, that they cannot be separated without more difficulty than they could from the original ore. This addition is therefore not to be made till the sulphur be previously well expelled.

Fluors or *fusible spars* facilitate the fusion of most metallic minerals, and also of calcareous and argillaceous earths, of steatites, asbestus, and some other unfusible stones, but not of silicious earths without a mixture of calcareous earth.

Quartz is sometimes added in the fusion of ferruginous copper ores, the use of which is said chiefly to be, to enable the ore to receive a greater heat, and to give a more perfect vitrification to the ferruginous scoria.

The *fusible stones*, as *slates*, *basaltes*, are so tenacious and thick when fused, that they cannot be considered properly as fluxes, but as matters added to lessen the too great liquidity of some very fusible minerals.

The *scoria* obtained in the fusion of an ore is frequently useful to facilitate the fusion of an ore of the same metal, and sometimes even ores of other metals.

Sulphurated pyrites greatly promote the fusibility of the scoria of metals, from the sulphur it contains. It is chiefly added to difficultly-fusible copper-ores, to form the sulphureous compounds called *matts*, that the ores, Smelting of Ores of Silver.

ores thus brought into fusion may be separated from the adhering earthy matters, and that the ferruginous matter contained in them may be destroyed, during the subsequent calcination and fusion, by means of the sulphur.

As in the ores called *calciform*, the metallic matter exists in a calcined state; and as calcination reduces the metals of mineralised ores (excepting the perfect metals) to that state also; therefore all calciform and calcined ores require the addition of some inflammable substance, to reduce them to a metallic state. In great works, the charcoal or other fuel used to maintain the fire produces also this effect

Metals are sometimes added in the fusion of ores of other more valuable metals, to absorb from these sulphur or arsenic. Thus iron is added to sulphurated, cupreous, and silver ores. Metals are also added in the fusion of ores of other more valuable metals, to unite with and collect the small particles of these dispersed through much earthy matter, and thus to assist their precipitation. With these intentions lead is frequently added to ores and minerals containing gold, silver, or copper.

Ores of metals are also sometimes added to assist the precipitation of more valuable metals. Thus antimony is frequently added to assist the precipitation of gold intermixed with other metallic matters. Thus far of smelting of ores in general.

Sect. III. *Smelting of Ores of Silver.*

§ 1. As silver, even in its proper ores, is always allayed with some other metals from which it is intended to be separated after the silver-ore has been well roasted, it must be mixed with a greater or less quantity of lead previous to its fusion.

Lead has the same effect in fusion of gold and silver as mercury has upon these metals by its natural fluidity; that is to say, it unites with them, and separates them from unmetallic matters, which, being lighter, rise always to the surface. But lead has the further advantage of procuring, by its own vitrification, that of all metallic substances, excepting gold and silver. Hence it follows, that when gold and silver are obtained by means of mercury, they still remain allayed with other metallic substances; whereas when they are obtained by fusion and scorification with lead, they are then pure, and not allayed with any metals but with each other.

In proportion as the lead, which has been united to the gold and silver of the ore, is scorified by the action of the fire, and promotes the scorification of the other metallic matters, it separates the perfect metals, and carries with it all the others to the surface. There it meets the unmetallic substances, which it likewise vitrifies, and which it changes into a perfect scoria, fluid, and such as a scoria ought to be to admit all the perfect metal contained in it to precipitate.

When all heterogeneous matters have been thus disengaged by scorification with lead, the perfect metals, to which some lead still remains united, are to be further purified by the ordinary operation of the cupel.

The common rule for the fusion and scorification of silver-ore with lead, is to add to the ore a quantity of lead so much greater as there is more matter to be scorified, and as these matters are more refractory and of more difficult fusion. Silver ores, or those treated as such, are often rendered refractory by ferruginous earths, pyritous matters, or cobalts, containing always a considerable quantity of an earth which is unmetallic, very subtile, and very refractory, and which renders a considerable augmentation of the quantity of lead necessary.

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The quantity of lead which is commonly added to fusible silver ores, that do not contain lead, is eight times the quantity of the ore. But when the ore is refractory, it is necessary to add twelve times the quantity of lead, and even more; also glass of lead, and fluxes, such as the white and black fluxes; to which however borax and powder of charcoal are preferable, on account of the liver of sulphur formed by these alkaline fluxes.

It is necessary to observe, that saline fluxes are only used in small operations, on account of their dearness. To these are substituted, in the great operations, of which we now treat, sandiver, fusible scoria, and other matters of little value.

The greatest part of silver now employed in commerce is not obtained from the proper ores of silver, which are very scarce; but from lead, and even copper ores, which are more or less rich in silver. To give an idea of the manner of treating these kinds of ores, from which silver is extracted in the great works, we shall briefly describe here, after Schlutter, the smelting of the ore of Ramelsberg, which contains, as we have already said, several different kinds of metals, but particularly lead and silver.

When this mineral has been disengaged from its sulphur as much as possible by three very long roastings, it is melted, in the Lower Hartz in Saxony, in a particular kind of furnace, called a *furnace for smelting upon a hollow or casse*. The masonry of this furnace is composed of large thick slates, capable of sustaining great heat, and cemented together by clay. The interior part of the furnace is three feet and a half long, and two feet broad at the back part, and one foot only in the front. Its height is nine feet eight inches. It has a foundation of masonry in the ground; and in this foundation channels are made for the evaporation of the moisture. These channels are covered over with stones called *covering stones*. The hollow or casse, which is made above these, is formed of bricks, upon which are placed, first, a bed of clay; then a bed of small ore and sifted vitriols; and, lastly, a bed of charcoal powder beat down, called *light brasque*. The anterior wall of the furnace is thinner than the others, and is called the *chemise*. The back wall, which is pierced to give passage to the pipes of two large wooden bellows, is called the *middle wall*. When the furnace is thus prepared, charcoal is thrown into the hollow, or casse; which being kindled, the fire is to be continued during three hours, before the matters to be fused are added. Then these matters are thrown in, which are not the pure ore, but a mixture of several substances, all of which are somewhat profitable. The quantity of these matters is sufficient for one day's work; that is, for a fusion of eighteen hours; and it consists of, 1. Twelve schorbens or measures of well roasted Rammelsberg ore (the schorben is a measure whose contents are two

two feet five inches long, one foot seven inches broad, and a little more than a foot deep: it is equal to 32 quintals of that country, Cologn weight, at 123 pounds each quintal). 2. Six meafures of fcoria produced by the fmelting of the ore of Upper Hartz, which is refractory, and what workmen call *cold.* 3. Two meafures of knobben, which is an impure fcoria containing fome lead and filver, which has been formerly thrown away as ufelefs, and is now collected by women and children. Befides thefe, other matters are added, containing lead and filver, as the tefts employed in refining, the drofs of lead, impure litharge, and any rubbifh containing metal, which was left in the furnace after the foregoing fufion. All thefe matters being mixed together, are thrown into the furnace: and to each meafure of this mixture a meafure of charcoal is added. The fufion is then begun by help of bellows; and as it proceeds, the lead falls through the light brafque or charcoal-bed into the hollow, or caffe, where it is preferved from burning under the powder of charcoal. The fcoria, on the other hand, being lighter and lefs fluid, is fkimmed off from time to time by means of ladles, that it may not prevent the reft of the lead from falling down into the hollow. Thus, while the fufion lafts, frefh matters and frefh charcoal are alternately added, till the whole quantity intended for one fufion, or, as they call it, one *day*, be thrown in.

There are feveral effential things to be remarked in this operation, which is very well contrived. Firft, The mixture of matters from which a little lead and filver is procured, which would otherwife be loft; and which have alfo this advantage, that they retard the fufion of the Ramelfberg ore, which, however well roafted it has been, retains always enough of the fulphur and iron of the pyrites mixed with it, to render it too fufible or too fluid; fo that without the addition of thofe matters nothing would be obtained but a matt. It is even neceffary, notwithftanding thefe additions, not to haften the fufion too much, but to give time for the ore to mix with other matters, elfe it would melt and flow of itfelf before the reft. Secondly, The fufion of the ore through charcoal, which is practifed in moft fmelting-houfes, and for almoft all ores, is an excellent method, the principal advantage of which is the faving of fuel. The action of the burning charcoal directed immediately upon the mineral, at the fame time that it melts it more readily and efficacioufly, alfo fupplies it with the phlogifton neceffary to bring it to a perfect ftate.

From the Ramelfberg ore after its firft roafting a *white vitriol* is obtained and prepared at Goflar, whofe bafis was *zinc:* which proves that this ore contains alfo a certain quantity of this femimetal. As this ore is fmelted in a country where the art is well underftood of extracting every thing which a mineral contains, fo in this fufion *zinc* and *cadmia* are obtained in the following manner: When the furnace is prepared for the fufion, it is neceffary to clofe it up in the fore part before the fufion is begun.

"Firft of all, a gritt-ftone is to be placed, fupported at the height of three inches. This ftone is as long as the furnace is broad, and the height of it is level with the hole where the bellows-pipe enters. It is faftened on each fide of the furnace, externally and internally, with clay. Upon this ftone a kind of receptacle, or, as it is called, the *feat of the zinc*, is made in the following manner: A flat flaty ftone is chofen, as long as the furnace is broad, and eight inches in breadth. This is placed on the gritt-ftone above mentioned, in fuch a manner that it inclines confiderably towards the front of the furnace, and that its bottom touches clofely the gritt-ftone. It is faftened with clay, which is alfo laid upon the feat of the zinc. Upon this feat, which is to receive the zinc, two round pieces of charcoal are placed, and alfo a ftone called the *zinc-ftone*, which is about a foot and an half in length, and clofes one part of the front of the furnace. This ftone alfo is faftened on each of its fides with clay. Clay is likewife put under the ftone betwixt the two pieces of charcoal, which hinder it from touching the feat of the zinc. The under-part of this ftone is but flightly luted, that the workmen may make an opening for the zinc to flow out. Thus is made the feat or receptacle of the zinc to detain this metallic fubftance, which would otherwife fall into the hotteft part of the fire, called by the workmen the *melting-place*, and would be there burnt: whereas it is collected upon this receptacle during the fufion, where it is fheltered from the action of the bellows, and confequently from too great heat.

"When all the matter to be fufed in one day is put into the furnace, the blaft of air is continued till that matter has funk down. When it is half way down the furnace, they draw out the fcoria, that more of the ore and other matters may be expofed to the greateft heat. As foon as the fcoria is coolled and fixed a little, two fhovel-fulls of fmall wet fcoria or fand is thrown clofe to the furnace, and beat down with the fhovel; then the workmen open the feat or receptacle of zinc, and ftrike upon the zinc-ftone to make the femimetal flow out. As foon as the pureft part of it has flowed out, it is fprinkled with water and carried away. Then the workmen feparate entirely the zinc-ftone from the wall of the furnace, and they continue to give it little ftrokes, that the fmall particles of zinc difperfed among the charcoal may fall down. This being done, the ftone is removed; and the zinc is feparated from the charcoal by an iron inftrument, is cleaned, and remelted along with the zinc that flowed out at firft, and is caft into round cakes. The reafon why the zinc is withdrawn before the bellows ceafe to blow, is, that if it was left till the charcoal on the feat or receptacle was confumed, it would be moftly burnt, and little would be obtained. Thus after the zinc is withdrawn, the fufion is finifhed by blowing the bellows till the end."

Thus the zinc is feparated from the ore of Ramelfberg, and is not confounded in the hollow or caffe with the lead and filver, becaufe, being a volatile femimetal, it cannot fupport the activity of the fire without rifing into vapours, which are condenfed in the place leaft hot, that is to fay, upon the ftones exprefsly prepared for that purpofe; and which, being much thinner than the other walls of the furnace, are continually coolled by the external air.

It is alfo in this furnace, and after the fufion of the Ramelfberg ore, that the *cadmia of zinc*, or the *cadmia of furnaces*, is obtained. This ore is compofed of fulphureous and ferruginous pyrites, of true lead-

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lead-ore containing silver, and a very hard and compact matter of a dark brownish-grey colour, which is probably a *lapis calaminaris*, or an ore of zinc. These several matters of the Ramelsberg ore are not separated from each other, either for the roasting or for the fusion. Thus there is zinc in all the parts of the roasted ore; and much more of it would be obtained, if it was not so easily inflammable. All the zinc which is obtained is preserved from burning by falling, while in fusion, behind the chemise or fore-part of the furnace, which is, as has been said, a kind of schistus or slate, called by the workmen *steel-stone*. But the part of this semimetal which falls in the middle of the furnace, near the middle-wall, or towards the sides, being exposed to the greatest heat of the fire, is there burnt; and its smoke or flowers attaching itself on all sides to the walls of the furnace, undergo there a semifusion, which renders this matter so hard and so thick, that it must be taken away after every fourth fusion, or, at most, after every sixth fusion. That which is found attached to the highest part of the furnace is the best and purest. The rest is altered by a mixture of a portion of lead which it has carried up with it; and which, from its great weight and fixity, has hindered the zinc from rising so high as it would have done alone. Therefore, with this kind of impure cadmia, ductile brass cannot be made.

Almost all the zinc we have, as well as the cadmia of the furnaces, is obtained from the Ramelsberg ore by the process described, and consequently is not the produce of a pure ore of zinc or *lapis calaminaris*, which is never fused for that purpose. Before Mr Margraaf, although it was well known that this ore contained zinc, and that it was employed for the making of brass, a convenient process for extracting zinc from it was not known; because, when treated by fusion with fluxes, like other ores, it does not yield any zinc: which proceeds partly from the refractory quality of the earth contained in the calamine, that cannot be fused without a very violent fire; and also from the volatility and combustibility of the zinc, which for this reason cannot be collected at the bottom of a crucible, as a regulus under a scoria, like most metals.

M. Margraaf has remedied these inconveniences by distilling *lapis calaminaris*, mixed with charcoal, in a retort, to which is joined a receiver containing some water, and consequently in close vessels, where the zinc, by the help of a very strong fire indeed, is sublimed in its metallic form without burning. He also by the same method reduced into zinc the *flowers of zinc*, or *pompholix*, *cadmia of the furnaces*, *tutty*, which is also a kind of cadmia; in a word, all matters capable of producing zinc by combination with phlogiston.—But it is evident that such operations as these are rather fit to supply proofs for chemical theory, than to be put in practice for works in great. M. Margraaf has observed, that the zinc which he obtained by this process was less brittle than what is obtained from the fusion of ores; which may proceed from its greater purity, or from its better combination with phlogiston.

Zinc is obtained, not only in the method used at Goslar above described; but is also extracted in great works, from *lapis caluminaris* and calcined blend, by a distillation similar to that by which M. Margraaf has essayed ores of zinc. The first work of that kind was erected in Sweden by Mr Von Swab, in the year 1738. The ore employed was a kind of blend; this ore, when calcined, powdered, and mixed with charcoal, was put into iron or stone retorts, and the zinc was obtained by distillation. In Bristol a work is established in which zinc is obtained by distillation *by descent*.

Fining of Silver.

After this digression which we have now made concerning the operation in the great by which zinc and cadmia are obtained, and which we could not insert elsewhere, because of the necessary relation it has with the smelting of the Ramelsberg ore, we proceed to the other operations of the same ore; that is to say, to the *finery*, by which the silver is separated from the lead, which are mixed together, forming what is called the *work*.

This operation differs from the *fining of essay*, or *in small*, principally in this circumstance, that in the latter method of fining all the litharge is absorbed into the cupel, whereas in the former method the greatest part of this litharge is withdrawn.

The fining in great of the work of Ramelsberg is performed in a furnace called a *reverberatory furnace*. This furnace is so constructed that the flame of wood burning in a cavity called the *fire-place*, is determined by a current of air (which is introduced through the ash-hole, and which goes out at an opening on one side of that part of the furnace where the work is, that is, where the lead and silver are) to circulate above, and to give the convenient degree of heat, when the fire is properly managed. In this furnace a great cupel, called a *test*, is disposed. This test is made of the ashes of beech-wood, well lixiviated in the usual manner. In some founderies different matters are added, as sand, spar, calcined gypsum, quicklime, clay. When the test is well prepared and dried, all the work is put at once upon the cold test, to the quantity of 64 quintals for one operation. Then the fire is lighted in the fire-place with faggots; but the fusion is not urged too fast, 1. That the test may have time to dry; 2. Because the work of the Ramelsberg ore is allayed by the mixture of several metallic matters, which it is proper to separate from it, otherwise they would spoil the litharge and the lead procured from it. These metallic matters are, copper, iron, zinc, and matt. As these heterogeneous substances are hard and refractory, they do not melt so soon as the work, that is, as the lead and silver; and when the work is melted, they swim upon its surface like a skin, which is to be taken off. These impurities are called the *scum* or the *first-waste*. What remains forms a second scum, which appears when the work is at its greatest degree of heat, but before the litharge begins to form itself. It is a scoria which is to be carefully taken off. It is called the *second waste*.

When the operation is at this point, it is continued by the help of bellows, the wind of which is directed, not upon the wood or fuel, but upon the very surface of the metal, by means of iron-plates put for that purpose before the blast-hole, which are called *papilions*. This blast does not so much increase the intensity of the fire, as it facilitates the combustion of the lead, and throws the litharge that is not imbibed by the test towards a channel, called the *litharge-way*, through which

Various processes for extracting Silver.

which it flows. The litharge becomes fixed out of the furnace: the matter which is found in the middle of the largest pieces, and which amounts to about a half or a third of the whole, is friable, and falls into powder like sand. This is put into barrels containing each five quintals of it; and is called *saleable litharge*, because it is sold in that state. The other part, which remains solid, is called *cold litharge*, and is again melted and reduced into lead. The fusion is called *cold fusion*, and the lead obtained from it *cold lead*, which is good and saleable when the work has been well cleared from the heterogeneous matters mentioned above. The tests and cupels impregnated with litharge are added in the fusion of the ore, as we have already related.

When two-thirds, or nearly that quantity, of the lead are converted into litharge, no more of it is formed. The silver then appears covered with a white skin, which the finers call *lightening*, and the metal *lightened* or *fined silver*.

The silver obtained by this process of fining is not yet altogether pure. It still contains some lead, frequently to the quantity of four drams in each marc, or eight ounces. It is delivered to the workmen, who complete its purification by the ordinary method. This last operation is the refining, and the workmen employed to do it are called *refiners*. A fining of 64 quintals of work, yields from 8 to 10 merks of fined silver, and from 35 to 40 quintals of litharge; that is, from 12 to 18 of saleable litharge, from 22 to 23 of cold litharge, from 20 to 22 quintals of impregnated test, and from 6 to 7 quintals of lead-dross. The operation lasts from 16 to 18 hours.

§ 2. Ores containing silver may be divided into four kinds, 1. Pure, or those which are not much compounded with other metals. 2. Galenical, in which the silver is mixed with much galena, or ore of lead mineralised by sulphur. 3. Pyritous, in which the silver is mixed with the martial pyrites. 4. Cupreous; in which the silver is contained in copper ores. To extract the silver from these several kinds of ores, different operations are necessary.

Native silver is separated from its adhering earths and stones by amalgamation with mercury in the manner directed for the separation of gold; or by fusion with lead, from which it may be afterwards separated by cupellation.

Pure ores seldom require a previous calcination; but when bruised and cleansed from extraneous matters, may be fused directly, and incorporated with a quantity of lead; unless they contain a large proportion of sulphur and arsenic, in which case a calcination may be useful. The lead employed must be in a calcined or vitrified state, which, being mixed with the ore, and gradually reduced by the phlogiston of the charcoal added to it, may be more effectually united with the silver of the ore, than if lead itself had been added, which would too quickly precipitate to the bottom of the containing vessel or furnace. The silver is to be afterwards separated from the lead by cupellation.

Galenical ores, especially those in which pyrites is intermixed, require a calcination, which ought to be performed in an oven, or reverberatory furnace. They are then to be fused together with some inflammable matter, as charcoal, by which the lead is revived, and together with the silver is precipitated.

Pyritous ores must be first melted, so as to form a matt. If the sulphur is not sufficient for this kind of fusion, more sulphurated pyrites may be added. This matt contains, besides silver and sulphur, also various metals, as lead, iron, and sometimes cobalt. The matt must be exposed to repeated calcinations till the sulphur is dissipated. By these calcinations most of the iron is destroyed. The calcined matt is to be fused with litharge, and the silver incorporated with the revived lead; from which, and from the other imperfect metals with which it may be mixed, it must afterwards be separated by cupellation.

The silver contained in cupreous ores may be obtained, either, 1. By separating it from the copper itself, after this has been extracted along with the silver, in the usual manner, from the ore; or, 2. By precipitating it immediately from the other matters of the ore.

1. It may be separated from the copper by two methods. One of these is by adding lead, and scorifying the imperfect metals. By this method much of the copper would be destroyed, and it is therefore not to be used unless the quantity of silver relatively to the copper be considerable. Another method by which silver may be separated from copper is by eliquation; that is, by mixing the mass of copper and silver with a quantity of lead, and applying such a heat as shall be just sufficient to make the lead eliquate from the copper, together with the silver, which being more strongly disposed to unite with the lead than with the copper, is thus incorporated with the former metal, and separated from the latter.

2. Silver may also be extracted from these cupreous ores by precipitation. For this purpose, let the ore, previously bruised and cleansed, be formed into a matt, that the earthy matters may be well separated. Let the matt be then fused with a strong heat; and when the scoria has been removed, and the heat is diminished, add to it some clean galena, litharge, and granulated lead. When the fire has been raised, and the additions well incorporated with the matt, let some cast or filed iron be thrown into the liquid mass, which, being more disposed than lead is to unite with sulphur, will separate and precipitate the latter metal, and along with it the silver or gold contained in the matt. This method was introduced by Scheffer, and is practised at Adelfors in Smoland. In this work the proportion of the several materials is, four quintals of matt, two quintals of black copper containing some lead with the perfect metal, one quintal of galena, one quintal of litharge, a fifth part of a quintal of granulated lead, and an equal quantity of cast iron.

The silver in this, and in all other instances where it is united with lead, is to be afterwards separated from the lead by cupellation; which process is described at the articles *Essay of the Value of Silver*, and Refining.

Sect. IV. *Smelting of Ores of Copper.*

§ 1. The smelting in great of copper ores, and even of several ores of silver and lead, excepting that of Rammelsberg, is performed in furnaces not essentially different

Smelting of Ores of Copper.

ferent from that already defcribed; but in this refpect only, that the fcoria and metal are not drawn out of the furnace, but flow fpontaneoufly, as foon as they are melted, into receiving bafons, where the metal is freed from the fcoria. Thefe furnaces are generally called *pierced furnaces*.

Inftead of a light brafque, or bed of charcoal powder, under which the metal lies hid, the bottom of thefe furnaces is covered with a bafon compofed of heavy brafque, which is a mixture of charcoal-powder and clay. In the front of the furnace, and at the bottom of the chemife, there is a hole, called the *eye*, through which the melted matter flows, and runs along a trench or furrow, called the *trace*, into one or more receiving bafons made of earth, fcoria, fand, &c. There the metal is feparated from the fcoria, by making it flow from thefe bafons into another lateral one. Thefe furnaces are alfo called *crooked furnaces*.

Different names are given to them according to fome difference in their conftruction. For inftance, thofe which have two eyes, and two traces, through which the melted matter flows alternately into two bafons, are called *fpectacle-furnaces*. Their greater or lefs height gives occafion alfo to the diftinction of *high furnaces* and *middle furnaces*.

The high furnaces are of modern invention. They were firft introduced at Mansfeldt in the year 1727; and they are now ufed in almoft all countries where ores are fmelted, as in Saxony, Bohemia, Hungary, &c. Their chief advantage confifts in fimplifying and diminifhing the labour. This advantage is effected by the great height of the furnace, which allows the ore to remain there a long time before it falls down into the hotteft part of the fire and is melted. Confequently, it fuffers fucceffively different degrees of heat; and, before it is melted, it undergoes a roafting which cofts nothing: therefore the high furnaces are chiefly employed for crude fufions; and particularly for the flate-copper ore. Thefe furnaces are above 18 feet high. A too great height is attended with an inconvenience, befides the trouble of fupplying it with ore and fuel, which is, that the charcoal is moftly confumed before it gets down where the greateft heat is required, and is then rendered incapable of maintaining a fire fufficiently intenfe.

All the furnaces which we have mentioned are fupplied with large bellows, moved by the arbor of a wheel, which is turned round by a current of water.

The only kind of furnace for fmelting ores where bellows are not employed, is what is called a *reverberatory furnace*. The Germans call it a *wind furnace*. It is alfo diftinguifhed by the name of *Englifh furnace*, becaufe the invention of it is attributed to an Englifh phyfician of the name of *Wright*, who was well verfed in chemiftry; and becaufe the ufe of it was firft introduced in England about the end of the laft century, where it is much employed, as well as in feveral other countries, as at Konigfberg, in Norway.

The length of thefe furnaces is about 18 feet, comprehending the mafonry: their breadth is 12 feet, and their height nine feet and a half. The hearth is raifed three feet above the level of the foundery: on one fide is the fire-place, under which is an afh-hole hollowed in the earth; on the other fide is a bafon made, which is kept covered with fire when there is occafion: on the anterior fide of this furnace there is a chimney, which receives the flame after it has paffed over the mineral that is laid upon the hearth. This hearth, which is in the interior part of the furnace, is made of a clay capable of fuftaining the fire. The advantage of this furnace is, that bellows are not neceffary; and confequently it may be conftructed where there is no current of water, and wherever the mine happens to be. This furnace has a hole in its front, through which the fcoria is drawn out; and a bafon, as we have faid, on one fide, made with fand, in which are oblong traces for the reception of the matt, and of the black copper, when they flow out of the furnace.

Copper is generally mineralifed, not only by fulphur and arfenic, but alfo by femimetals and pyritous matters, and is frequently mixed with other metals. As this metal has great affinity with fulphur and arfenic, it is almoft impoffible to difengage it from them entirely by roafting: hence, in the fmelting in great, nothing is obtained by the firft operation but a copper matt, which contains all the principles of the ore, excepting the earthy and ftony parts, particularly when the ore is fmelted crude and unroafted. Afterwards this matt muft be again roafted and fufed. The produce of this fecond fufion begins ftill more to refemble copper, but is not malleable. It continues mixed with almoft all the minerals, particularly with the metals. As it is frequently of a black colour, it is always called *black copper*, when it is unmalleable, whatever its colour happens really to be.

As, of all the imperfect metals, copper is moft difficultly burnt and fcorified, it is again remelted feveral times, in order to burn and fcorify the metallic fubftances mixed with it; and this is done till the copper is perfectly pure, which is then called *red* or *refined copper*, and thefe laft fufions are called the *fining* and *refining* of it: red copper contains no metals but gold and filver, if any of thefe happened to be in the ore.

In order to avoid all thefe fufions, it has been propofed to treat in the humid way certain copper ores, particularly thofe which are very pyritous. This method confifts in making blue vitriol from the ore, by roafting and lixiviating it, and in precipitating pure copper from this lixivium, which is called *cement-water*, by means of iron: but it is not much practifed, becaufe it has been obferved, that all the copper contained in the ore was not procured by this means.

As expence is not much regarded in fmall effays and experiments, thefe fufions are much abridged and facilitated by adding at firft faline and glaffy fluxes; and then by refining the black copper with lead in the cupel, as gold and filver are done. In this method of refining, it is to be moft carefully obferved, that the metal be fufed as quickly as poffible, and expofed to no more heat than is neceffary, left it be calcined.

When the black copper contains fome iron, but not a great

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a great deal, the lead presently separates the iron from it, and makes it rise to the surface of the copper: but if the iron be in too large a proportion, it prevents the lead from uniting with the copper. These two phenomena depend on the same cause, which is, that lead and iron cannot unite.

Frequently copper ores contain also a quantity of silver sufficient to make its extraction by particular processes profitable. It was long before any process could be thought of for this purpose which was not too expensive and troublesome: but at length it is accomplished by the excellent operation called *eliquation*.

The copper from which silver has been separated by eliquation must be refined after this operation, as it is generally black copper from which silver is extracted: but even if it had not been black copper which was employed for this operation, it would require to be refined on account of a little lead it always retains. It is therefore carried to the refiner's furnace, when this operation is performed by help of bellows, the blast of which is thrown upon the surface of the melted metal. As in this refining of copper the precise time when it becomes pure cannot be known, because scoria is always formed on its surface, it is necessary to use an essay-iron, the polished end of which being dipt in melted copper, shows that this metal is pure when the copper adhering to the iron falls off as soon as it is dipt in cold water.

When this mark of the purity of the copper has been observed, its surface ought to be well cleaned; and as soon as it begins to fix, it must be sprinkled with a broom or besom dipped in cold water. The surface of the copper which is then fixing, being suddenly cooled by the water, detaches itself from the rest of the metal, is taken hold of by tongs, and is thrown red-hot into cold water. By again sprinkling water on the mass of copper, it is all of it reduced into plates, which are called *rosettes*, and these plates are what is called *rosette-copper*

§ 2. The copper of pyritous cupreous ores cannot be obtained without several operations, which vary according to the nature of the ores. These operations are chiefly roastings and fusions. By the first fusion a matt is produced, which is afterwards to be roasted; and thus the fusions and roastings are to be alternately applied, till by the last fusion copper is obtained. These methods of treating pyritous copper ores depend on the two following facts: 1. Sulphur is more disposed to unite with iron than with copper. 2. The iron of these ores is destructible by the burning sulphur during the roasting or the fusion of the ores, while the copper is not injured. This fact appears from experiments mentioned by Scheffer and by Wallerius, and from the daily practice of smelting cupreous ores.

From these facts we learn, 1. That sulphur may be employed to separate and destroy iron mixed with copper. 2. That iron may be employed to separate the sulphur from copper, as is sometimes done in the essay of sulphurated copper-ores. 3. That by adjusting the proportion of the iron and sulphur to each other in the smelting of copper-ores, these two substances may be made to destroy each other, and to procure a separation of the copper: and this adjustment may be effected, by adding sulphur or sulphureous pyrites to the copper-ore, when the quantity of sulphur contained in this ore relatively to the iron is too small; or by adding iron when the sulphur predominates; or by roasting, by which the superfluous sulphur may be expelled, and no more left than is sufficient for the destruction of the iron contained in the ore. We shall apply these principles to the following cases.

1. When the quantity of sulphur and of iron in a copper-ore is small, and especially when the iron does not too much abound, a previous roasting will at once calcine the iron, and expel most of the sulphur; so that by one fusion the calcined iron may be scorified, and black copper may be obtained. If the sulphur has not been sufficiently expelled, a second roasting and fusion are requisite; for the whole quantity of sulphur ought not to be expelled during the first roasting: but as much ought to be left as is sufficient for the scorification of the calcined iron; otherwise this might, during the fusion, be again revived and united with the copper.

2. If, in a copper ore, the quantity of iron be too great, relatively to the sulphur, some sulphurated pyrites, especially that kind which contains copper, ought to be added, that a matt may be obtained, and that the iron may be calcined and scorified.

3. When the quantity of sulphur and iron is very great, that is, when the ore is very pyritous and poor, it ought to be first formed into a matt; by which it is separated from the adherent earths and stones, and the bulk is diminished: then by repeated and alternate roastings and fusions, the copper may be obtained.

4. When the quantity of sulphur in an ore is greater than is sufficient for the forming a matt, the superfluous quantity ought to be previously expelled by roasting.

The copper thus at first obtained is never pure, but is generally mixed with sulphur or with iron. It is called *black copper*. This may be refined in furnaces, or on hearths.

In the former method, to the copper when melted a small quantity of lead is added, which unites with the sulphur, and is scorified together with the iron, and floats upon the surface of the melted copper. This purification of copper by means of lead is similar to the refining of silver by cupellation; and is founded on the property of lead, by which it is more disposed to unite with sulphur than copper is; and on a property of copper, by which it is less liable than any other imperfect metal to be scorified by lead. But as copper is also capable of being scorified by lead, this operation must be no longer continued, and no more lead must be employed, than is sufficient for the separation of the sulphur, and for the scorification of the iron.

The copper might also be purified from any remaining sulphur by adding a sufficient quantity of iron to engage the sulphur. Thus Mr Scheffer found, that by adding to sulphurated copper from $\frac{1}{20}$th to $\frac{1}{18}$th of old cast iron, he rendered the copper pure and ductile. See his Dissertation on the Parting of Metals amongst the *Swedish Memoirs* for the year 1752. In this purification, the quantity of iron added ought not to be too little, else all the sulphur will not be separated; and it ought not to be too great, else the superfluous quantity will unite with and injure the purity of the copper. The fusion and scorification, with addition of lead, seems to be the best method for the last purification of copper.

Sect. V. *Smelting*, &c. *of Ores of Iron.*

Notwithstanding the great importance of this subject, and the labours of Reaumur, Swedenborgius, and of some other authors, we have still a very imperfect knowledge of the causes of the differences of the several kinds of ores, of the methods of smelting best adapted to these differences, of the causes of the good and bad qualities of different kinds of iron, and of the means of so meliorating this metal, that we may obtain tough and ductile iron from any of its ores.

Swedenborgius has very industriously and exactly described the different processes now used in most parts of Europe for the smelting of ores of iron, for the forging of that metal, and for the conversion of it into steel: but we do not find that he or any other author have, by experiments and discoveries, contributed much to the illustration or to the improvement of this part of metallurgy, unless, perhaps, we except those of Mr Reaumur, concerning the softening of cast iron by cementation with earthy substances.

The ores of iron are known to vary much in their appearance, in their contents, in their degrees of fusibility, in the methods necessary for the extraction of their contained metal, and in the qualities of the metal when extracted.

Most ores require to be roasted previously to their fusion; some more slightly, and others with a more violent and longer-continued fire. Those which contain much sulphur, arsenic, or vitriolic-acid, require a long-continued and repeated roasting, that the volatile matters may be expelled. Of this kind is the black-iron ore, from which the Swedish iron is said to be obtained.

Some ores require a very slight roasting only, that they may be dried and rendered friable.—Such are the ores called *bog ores*, and others, which being in a calcined state, and containing little sulphureous matter, would, by a farther calcination, be rendered less capable of being reduced to a metallic state.

The roasting of ores of iron is performed by kindling piles, consisting of strata of fuel and of ore placed alternately upon one another, or in furnaces similar to those commonly employed for the calcination of limestone.

Some authors advise the addition of a calcareous earth to sulphureous ores during the roasting, that the sulphur may be absorbed by this earth when converted into quicklime. But we may observe, that the quicklime cannot absorb the sulphur or sulphureous acid, till these be first extricated from the ore, and does therefore only prevent the dissipation of these volatile matters; and, secondly, that the sulphur thus united with the quicklime forms a hepar of sulphur, which will unite with and dissolve the ore during its fusion, and prevent the precipitation of the metal.

The next operation is the *fusion* or *smelting* of the ore. This is generally performed in furnaces or towers, from 20 to 30 feet high, in the bottom of which is a bason for the reception of the fluid metal. When the furnace is sufficiently heated, which must be done at first very gradually, to prevent the cracking of the walls; a quantity of the ore is to be thrown in, from time to time, at the top of the furnace, along with a certain quantity of fuel and of lime-stone, or whatever other flux is employed. When the fuel below is consumed by the fire excited by the wind of the bellows, the ore, together with its proportionable quantity of fuel and of flux, sink gradually down, till they are exposed to the greatest heat in the furnace. There the ore and the flux are fused, the metallic particles are revived by the fuel, are precipitated by means of their weight through the scoria formed of the lighter earthy parts of the flux and of the ore, and unite in the bason at the bottom of the furnace, forming a mass of fluid metal covered by a glassy scoria. When a sufficient quantity of this fluid metal is collected, which is generally twice or thrice in 24 hours, an aperture is made, through which the metal flows into a channel or groove made in a bed of sand; and from thence into smaller lateral or connected channels, or other moulds. There it is cooled, becomes solid, and retains the forms of the channels or moulds into which it flows. The piece of iron formed in the large channel is called a *sow*, and those formed in the smaller channels are called *pigs*. Sometimes the fluid iron is taken out of the furnace by means of ladles, and poured into moulds ready prepared, of sand or of clay, and is thus formed into the various utensils and instruments for which cast iron is a proper material.

The *scoria* must be, from time to time, allowed to flow out, when a considerable quantity of it is formed, through an aperture made in the front of the furnace for that purpose. A sufficient quantity of it must, however, be always left to cover the surface of the melted iron, else the ore which would fall upon it, before the separation of its metallic from its unmetallic parts, would lessen the fluidity and injure the purity of the melted metal. This scoria ought to have a certain degree of fluidity; for if it be too thick, the revived metallic particles will not be able to overcome its tenacity, and collect together into drops, nor be precipitated. Accordingly, a scoria not sufficiently fluid, is always found to contain much metal. If the scoria be too thin, the metallic particles of the ore will be precipitated before they are sufficiently metallised, and separated from the earthy and unmetallic parts. A due degree of fluidity is given to the scoria by applying a proper heat, and by adding fluxes suited to the ore.

Some ores are fusible without addition, and others cannot be smelted without the addition of substances capable of facilitating their fusion.

The *fusible ores* are those which contain sulphur, arsenic, or are mixed with some fusible earth.

The *ores difficultly fusible* are those which contain no mixture of other substance. Such are most of the ores

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ores which contain iron in a ftate nearly metallic. As iron itfelf, when purified from all heterogeneous matters, is fcarcely fufible without addition, fo the metal contained in thefe purer kinds of ores cannot be eafily extracted without the addition of fome fufible fubftance. 2. Thofe which are mixed with fome very refractory fubftance. Some of thefe refractory ores contain arfenic; but as this fubftance facilitates the fufion of ores, we may prefume that their refractory quality depends upon a mixture of fome unmetallic earth or other unfufible fubftance. The earth which is mixed with the common calciform ores is in confiderable quantity; and is fometimes calcareous, fometimes filiceous, and fometimes argillaceous.

Perhaps the fufibility of different ores depends greatly on the degree of calcination to which the metal contained in them has been reduced; fince we have reafon to believe, that by a very perfect calcination, fome metals at leaft may be reduced to the ftate of an earth almoft unfufible, and incapable of metallifation; and fince we know, that in every calcination and fubfequent reduction of a given quantity of any imperfect metal, a fenfible part of that quantity is always loft or deftroyed, however carefully thefe operations may have been performed. That fome of thefe ores are already too much calcined, appears from the inftance above-mentioned of the *bog ores*, which are injured by roafting; and even the great height of the common fmelting furnaces, although advantageous to many ores that require much roafting, is faid to be injurious to thofe which are already too much calcined, by expofing them to a further calcination, during their very gradual defcent, before they arrive at the hotteft part of the furnace, where they are fufed.

But as too violent calcination renders fome ores difficultly fufible, fo too flight calcination of other ores injures the purity of the metal, by leaving much of the fulphureous or other volatile matter, which ought to have been expelled.

Various *fubftances are added to affift the fufion of ores difficultly fufible.* Thefe are, 1. *Ores* of a fufible quality, or which, being mixed with others of a different quality, become fufible: accordingly, in the great works for fmelting ores of iron, two or more different kinds of ore are commonly mixed, to facilitate the fufion, and alfo to meliorate the quality of the iron. Thus an ore yielding an iron which is brittle when hot, which quality is called *red-fhort*, and another ore which produces iron brittle when cold, or *cold-fhort*, are often mixed together; not, as fometimes fuppofed, that thefe qualities are mutually deftructive of each other, but that of each of them is diminifhed in the mixed mafs of iron, as much as this mafs is larger than the part of the mafs originally poffeffed of that quality. Thus, if from two fuch ores the mafs of iron obtained confifts of equal parts of cold-fhort and of red-fhort iron, it will have both thefe qualities, but will be only half as *cold-fhort* as iron obtained folely from one of the ores, and half as *red-fhort* as iron obtained only from the other ore. 2. *Earths* and *ftones* are alfo generally added to facilitate the fufion of iron ores. Thefe are fuch as are fufible, or become fufible when mixed with the ore, or with the earth adhering to it. Authors direct that, if this earth be of an argillaceous nature, limeftone or fome calcareous earth fhould be added; and that, if the adherent earth be calcareous, an argillaceous or filiceous earth fhould be added; becaufe thefe two earths, though fingly unfufible, yet, when mixed, mutually promote the fufion of each other: but as limeftone is almoft always added in the fmelting of iron ores, and as in fome of thefe, at leaft, no argillaceous earth appears to be contained, we are inclined to believe, that it generally facilitates the fufion, not merely by uniting with thofe earths, but by uniting with that part of the ore which is moft perfectly calcined, and leaft difpofed to metallifation; fince we know, that by mixing a calciform or roafted ore of iron with calcareous earth, without any inflammable matter, thefe two fubftances may be totally vitrified. See *Experiments made upon quicklime and upon iron, by Mr Brandt, in the Swedifh Memoirs for the years* 1749 *and* 1751. Calcareous earth does indeed fo powerfully facilitate the fufion of iron ores, that it deferves to be confidered whether workmen do not generally ufe too great a quantity of it, in order to haften the operation. For when the fcoria is rendered too thin, much earthy or unmetallifed matter is precipitated, and the caft iron produced is of too vitreous a quality, and not fufficiently approximated to its true metallic ftate.

Some authors pretend, that a principal ufe of the addition of limeftone in the fmelting of iron ores is to abforb the fulphur, or vitriolic acid, of thefe ores: but, as we have already obferved, a hepar of fulphur is formed by that mixture of calcareous earth and fulphur, which is capable of diffolving iron in a metallic ftate; and thus the quantity of metal obtained from an ore not fufficiently diverted of its fulphur, or vitriolic acid, (which, by uniting with the fuel, is formed into a fulphur during the fmelting), muft be confiderably diminifhed, though rendered purer, by addition of calcareous earth: hence the utility appears of previoufly expelling the fulphur and vitriolic acid from the ore by a fufficient roafting. 3. The *fcoria* of former fmeltings is frequently added to affift the fufion of the ore; and, when the fcoria contains much iron, as fometimes happens in ill-conducted operations, it alfo increafes the quantity of metal obtained.

The quantity of thefe fufible matters to be added varies according to the nature of the ore; but ought in general to be fuch, that the fcoria fhall have its requifite degree of thinnefs, as is mentioned above.

The *fuel* ufed in moft parts of Europe for the fmelting of ores of iron is charcoal. Lately, in feveral works in England and Scotland, iron ore has been fmelted by means of pit-coal, previoufly reduced to cinders or *coaks*, by a kind of calcination fimilar to the operation for converting wood into charcoal, by which the aqueous and fulphureous parts of the coal are expelled, while only the more fixed bituminous parts are left behind. In France, pit coal not calcined has been tried for this purpofe, but unfuccefsfully. The ufe of *peat* has alfo been introduced in fome parts of England.

The quality of the iron depends confiderably upon the quality and alfo upon the quantity of the fuel employed. Charcoal is fitter than coaks for producing

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ducing an iron capable of being rendered malleable by forging.

The quantity of fuel, or the intensity of the heat, must be suited to the greater or less fusibility of the ore. Sulphureous, and other ores easily fusible, require less fuel than ores difficultly fusible. In general, if the *quantity of fuel be too small*, and the heat not sufficiently intense, all the iron will not be reduced, and much of it will remain in the scoria, which will not be sufficiently thin. This defect of fuel may be known by the blackness and compactness of the scoria; by the qualities of the iron obtained, which in this case is hard, white, light, intermixed with scoria, smooth in its texture, without scales or grains, rough and convex in its surface, and liable to great loss of weight by being forged; and, lastly, it may be known by observing the colour and appearance of the drops of metal falling down from the smelted ore, and of the scoria upon the surface of the fluid metal, both which are darker-coloured than when more fuel is used. When the *quantity of fuel is sufficiently large*, and the heat is intense enough, the iron is darker-coloured, denser, more tenacious, contains less scoria, and is therefore less fusible, and loses less of its weight by being forged. Its surface is also smoother and somewhat concave; and its texture is generally granulated. The scoria, in this case, is of a lighter colour, and less dense. The drops falling down from the smelted ore and the liquid scoria in the furnace appear hotter and of a brighter colour. When the quantity of fuel is too great, and the heat too intense, the iron will appear to have a still darker colour, and more conspicuous grains or plates, and the scoria will be lighter, whiter, and more spongy. The drops falling from this smelted ore, and the fluid scoria, will appear to a person looking into the furnace through the blast-hole to be very white and shining hot. The quantity of charcoal necessary to produce five hundred weight of iron, when the ore is rich, the furnace well contrived, and the operation skilfully conducted, is computed to be about 40 cubic feet; but is much more in contrary circumstances.

The *time, during which the fluid metal ought to be kept in fusion* before it is allowed to flow out of the furnace, must also be attended to. How long that time is, and whether it ought not to vary according to the qualities of ores and other circumstances, we cannot determine. In some works the metal is allowed to flow out of the furnace every six or eight, and in others only every 10 or 12, hours. Some workmen imagine, that a considerable time is necessary for the concoction of the metal. This is certain, that the iron undergoes some change by being kept in a fluid state; and that if its fusion be prolonged much beyond the usual time, it is rendered less fluid, and also its cohesion, when it becomes cold, is thereby greatly diminished. The marquis de Courtivron says, that the cohesion may be restored to iron in this state, by adding to it some vitrescible earth, which he considers as one of the constituent parts of iron, and which he thinks is destroyed by the fusion too long continued. That the fusibility of cast-iron does depend on an admixture of some vitrescible earth, appears probable from the great quantity of scoria forced out of iron during its conversion into malleable or forged iron, and from the loss of fusibility which it suffers nearly in proportion to its loss of scoria. The quantity of iron daily obtained from such a furnace as is above described, is from two to five tons in 24 hours, according to the richness and fusibility of the ore, to the construction of the furnace, to the adjustment of the due quantity of flux and of fuel, and to the skill employed in conducting the operation.

The *quality of the iron* is judged of by observing the appearances during its flowing from the furnace, and when it is fixed and cold. If the fluid iron, while it flows, emits many and large sparkles; if many brown spots appear on it while it is yet red-hot; if, when it is fixed and cold, its corners and edges are thick and rough, and its surface is spotted; it is known to have a red-short quality. If, in flowing, the iron seems covered with a thin glassy crust, and if, when cold, its texture be whitish, it is believed to be cold-short. Mr Reaumur says, that dark-coloured cast iron is more impure than that which is white. The marquis de Courtivron is of a contrary opinion. But no certain rules for judging of the quality of iron before it be forged can be given. From brittle cast-iron, sometimes ductile forged iron is produced. Cast-iron with brilliant plates and points, when forged, becomes sometimes red-short and sometimes cold-short. Large shining plates, large cavities called *eyes*, want of sufficient density, are almost certain marks of bad iron; but whether it will be cold or red short cannot be affirmed till it be forged. Whiteness of colour, brittleness, closeness of texture, and hardness, are given to almost any cast iron by sudden cooling; and we may observe, that in general the whiter the metal is, the harder it is also, whether these properties proceed from the quality of the iron, or from sudden cooling; and that, therefore, the darker-coloured iron is fitter for being cast into moulds, because it is capable in some measure of being filed and polished, especially after it has been exposed during several hours to a red-heat in a reverberatory furnace, and very gradually cooled. This operation, called by the workmen *annealing*, changes the texture of the metal, renders it softer, and more capable of being filed than before, and also considerably less brittle.

Mr Reaumur found, that by cementing cast iron with absorbent earths in a red-heat, the metal may be rendered softer, tougher, and consequently a fit material for many utensils formerly made of forged iron. Whether cementation with absorbent earths gives to cast iron a greater degree of these properties than the annealing commonly practised, has not been yet determined.

In Navarre, and in some of the southern parts of France, iron-ore is smelted in furnaces much smaller, and of a very different construction from those above described. A furnace of this kind consists of a wide-mouthed copper-caldron, the inner surface of which is lined with masonry a foot thick. The mouth of this caldron is nearly of an oval or elliptic form. The space or cavity contained by the masonry is the furnace in which the ore is smelted. The depth of this cavity is equal to two feet and a half: the larger diameter of the oval mouth of the cavity is about eight feet, and its smaller diameter is about six feet: the space of the furnace is gradually contracted towards the bottom,

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bottom, the greateſt diameter of which does not exceed ſix feet: eighteen inches above the bottom is a cylindrical channel in one of the longer ſides of the caldron and maſonry, through which the nozzle of the bellows paſſes. This channel, and alſo the bellows pipe, are ſo inclined, that the wind is directed towards the loweſt point of the oppoſite ſide of the furnace. Another cylindrical channel is in one of the ſhorter ſides of the furnace, at the height of a few inches from the bottom, which is generally kept cloſed, and is opened occaſionally to give paſſage to the ſcoria: and above this is a third channel in the ſame ſide of the furnace, through which an iron inſtrument is occaſionally introduced to ſtir the fluid metal, and to aſſiſt, as is ſaid, the ſeparation of the ſcoria from it. The greateſt height of this channel is at its external aperture on the outſide of the furnace, and its ſmaller height is at its internal aperture; ſo that the inſtrument may be directed towards the bottom of the furnace; but the ſecond channel below it has a contrary inclination, that, when an opening is made, the ſcoria may flow out of the furnace into a baſon placed for its reception. When the furnace is heated ſufficiently, the workmen begin to throw into it alternate changes of charcoal and of ore previouſly roaſted. They take care to throw the charcoal chiefly on that ſide at which the wind enters, and the ore at the oppoſite ſide. At the end of about four hours, a maſs of iron is collected at the bottom of the furnace, which is generally about 600 weight; the bellows are then ſtopt; and when the maſs of iron is become ſolid, the workmen raiſe it from the bottom of the furnace, and place it, while yet ſoft, under a large hammer, where it is forged. The iron produced in theſe furnaces is of the beſt quality; the quantity is alſo very conſiderable, in proportion to the quantity of ore, and to the quantity of fuel employed. In theſe furnaces no limeſtone or other ſubſtance is uſed to facilitate the fuſion of the ore. We ſhould receive much inſtruction concerning the ſmelting of iron-ore, if we knew upon what part of the proceſs, or circumſtance, the excellence of the iron obtained in theſe furnaces depends; whether on the quality of the ore; on the diſuſe of any kind of flux, by which the proportion of vitreous or earthy matter, intermixed with the metallic particles, is diminiſhed; on the forging while the iron is yet ſoft and hot, as the Marquis de Courtivron thinks; or on ſome other cauſe, not obſerved.

The iron thus produced by ſmelting ores is very far from being a pure metal; and though its fuſibility renders it very uſeful for the formation of cannon, pots, and a great variety of utenſils, yet it wants the ſtrength, toughneſs, and malleability, which it is capable of receiving by further operations.

Caſt-iron ſeems to contain a large quantity of vitreous or earthy matter mixed with the pure iron; which matter is probably the chief cauſe of its fuſibility, brittleneſs, hardneſs, and other properties by which it differs from forged iron. The ſulphur, arſenic, and other impurities of the ore, which are ſometimes contained in caſt-iron, are probably only accidental, and may be the cauſes of the red-ſhort quality, and of other properties of certain kinds of iron: but the earthy matter above-mentioned ſeems principally to diſtinguiſh caſt-iron from forged or malleable iron; for, firſt, by depriving the former of this earthy matter, it is rendered malleable, as in the common proceſs hereafter to be deſcribed; and, ſecondly, by fuſing malleable iron with earthy and vitreſcible matters, it loſes its malleability, and is reſtored to the ſtate and properties of caſt-iron.

The earthy vitreous matter contained in caſt-iron conſiſts probably of ſome of the ferruginous earth or calx of the ore not ſufficiently metalliſed, and alſo of ſome unmetallic earth. Perhaps it is only a part of the ſcoria which adheres to, and is precipitated with, the metallic particles, from which it is more and more ſeparated, as the heat applied is more intenſe, and as the fuſion is longer continued.

To ſeparate theſe impurities from caſt-iron, and to unite the metallic parts more cloſely and compactly, and thus to give it the ductility and tenacity which render this metal more uſeful than any other, are the effects produced by the following operations.

The firſt of theſe operations is a fuſion of the iron, by which much of its impurities is ſeparated in form of ſcoria; and by the ſecond operation, a further and more complete ſeparation of theſe impurities, and alſo a cloſer compaction of the metallic particles, are effected by the application of mechanical force or preſſure, by means of large hammers.

Some differences in the conſtruction of the forge or furnace, in which the *fuſion* or *refining of caſt-iron* is performed, in the method of conducting the operation, and in other circumſtances, are obſerved to occur in different places. We ſhall deſcribe from Swedenborgius the *German method*.

The fuſion of the caſt-iron, which is to be rendered malleable, is performed upon the hearth of a forge ſimilar to that uſed by blackſmiths: at one ſide of this hearth is formed a cavity or fire-place, which is intended to contain the fuel and the iron to be melted: this fire-place is 20 inches long, 18 inches broad, and 12 or 14 inches deep: it is bounded on three ſides by three plates of caſt-iron placed upright; and on the fourth ſide, which is the front, or that part neareſt to which the workmen ſtand, by a large forge-hammer, through the eye of which the ſcoria is at certain times allowed to flow. The floor alſo of the fire-place is another caſt-iron plate. The thickneſs of theſe plates is from two to four inches. One of the upright ſide-plates reſts againſt a wall, in an aperture through which a copper-tube, called the *tuyere*, is luted with clay. This tube is a kind of caſe or covering for the pipe of a pair of bellows placed behind the wall, and its direction is therefore parallel to that of the bellows-pipe; but it advances about half a foot further than this pipe into the fire-place; and thus gives greater force to the air, which it keeps concentrated, or prevents the divergency of the air till it is required to act. The tube reſts upon the edge of the ſide-plate which leans againſt the wall, nearer to the back-part than to the front of the fire-place; and in ſuch an oblique direction, that the wind ſhall be impelled towards the furtheſt part of the floor of the fire-place, or where this floor is interſected by the oppoſite ſide-plate. The obliquity of the tuyere ought to vary according to the quality of the iron; and therefore, in every operation, it may be ſhifted till its proper poſition is found. The more nearly its direction approaches

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proaches to a horizontal plane, the more intenfe is the heat; but a larger quantity of fuel is confumed than is even proportional to the increafe of heat, becaufe the flame is not then fo well confined. When the iron is eafily fufible, great heat is not required: the tuyere may then decline confiderably from the horizontal plane, and thus fuel may be faved. This tuyere, tho' made of copper, a metal more eafily fufible than iron, is preferved from fufion by the conftant paffage of cold air through it. It muft be carefully kept open, and cleanfed from the fcoria, which would be apt to block up its cavity, by which not only the heat would be too much diminifhed for the fuccefs of the operation, but the tube itfelf would be melted.

To prepare for the fufion, a quantity of fcoria of a former operation is thrown into the fire-place, till one third-part of this be full; and the remaining two thirds of the fire-place are to be filled with fmaller fcoria, coal-duft, and fparks ejected from hot iron.—These matters, being fufible, form a bath for the reception of the iron when melted. Upon this bed of fcoria, the mafs of caft iron to be melted is placed; fo that one end of it fhall be within the fire-place, oppofite to the tuyere, and at the diftance of about four or five inches from its aperture; and the other end fhall ftand without the fire-place, to be pufhed in, as the former is melted. The upper fide of the mafs of iron ought to be in the fame horizontal plane as the upper part of the orifice of the tuyere, that the wind may, by means of the obliquity of its courfe, ftrike upon and pafs along the under-fide of the mafs; but if the iron be difficultly fufible, the tuyere is to be difpofed more horizontally, fo that the wind fhall ftrike directly upon the mafs of iron; and that one part of the blaft fhall graze along the upper furface, and the other part along the under furface of the iron. The mafs of iron weighs generally from 200 to 400 pounds. Sometimes two or three fmaller maffes are put one above another, fo as not to touch. When thefe are of different qualities, the cold-fhort piece is placed undermoft, that being more unfufible than the red-fhort. The iron being placed, charcoal-powder is thrown on both fides, and coals are accumulated above, fo as to cover entirely the iron.

The coals are then to be kindled, and the bellows are made to blow, at firft flowly, and afterwards with more and more force. The iron is gradually liquefied, and flows down in drops through the melted fcoria to the bottom of the fire-place; during which the workmen frequently turn the iron, fo that the end oppofed to the blaft of wind may be equally expofed to heat, and uniformly fufed. While the coals are confumed, more are thrown on, fo that the whole may be kept quite covered. During the operation, a workman frequently founds the bottom and corners of the fire-place by means of a bar or poker, raifes up any mafs of metal which he finds adhering to thefe, and expofes them to the greateft heat, that they may be more perfectly fufed.

When all the iron is fufed, no more coals are to be added; but the melted mafs is to remain half uncovered for fome time; during which the iron boils and bubbles, and its furface fwells and rifes higher and higher. When the iron has rifen as high as the upper edge of the fire-place, the coals upon its furface muft be removed; and by thus expofing it to cold air, its ebullition and fwelling fubfide. In this ftate, or coction, the iron is kept during half an hour or more, by adding occafionally pieces of good coal, which maintain a fufficient heat, without covering entirely the furface of the mafs. During this coction, the workmen allow the orifice of the tuyere to be half ftopped up by the fcoria, that the air may not blow upon the iron with all its force, by which it would be too much cooled. Accordingly, when they think that the coction has continued fufficiently long, they clear the paffage of the tuyere, and the mafs is foon cooled by the cold air. At the fame time alfo they open a paffage in the eye of the hammer placed in the front of the fire-place, through which fome of the fcoria is allowed to flow out. When the iron has become folid, the bellows are ftopt, the coals are removed, and the mafs is left during an hour; and then the workmen raife it from the fire-place, turn it upfide down, and proceed to the fecond coction or fufion of the iron.

From this fecond operation, the mafs is to be fo placed, that one part of it fhall reft upon the tuyere, and the other upon the fcoria remaining in the fire-place. This fcoria is to be difpofed in an oblique direction parallel to the tuyere, by which means the wind of the bellows is obliged to pafs along the under fide of the mafs of iron. About the fides of the mafs, charcoal-powder and burnt afhes are thrown; but towards the tuyere, dry and entire pieces of coals are placed, to maintain the fire. When thefe are kindled, more coals are added, and the fire is gradually excited. The workman attends to the direction of the flame, that it pafs equally along the under furface of the iron, quite to the further extremity, and that it do not efcape at the fides, nor be reverberated back towards the tuyere, by which this copper tube might be melted. During this fufion, pieces of iron are apt to be feparated from the mafs, and to fall down unfufed to the bottom and corners of the fire-place. Thefe are carefully to be fearched for, and expofed to the greateft heat till they are melted. When the whole mafs is thus brought into perfect fufion, the coals are removed; and the wind blowing on its fuface, whirls and diffipates the fmall remaining pieces of fcoria and fparks thrown out from the fluid iron. This jet of fire continues about feven or eight minutes, and the whole operation about two hours. In this fecond fufion the fcoria is to be thrice removed, by opening a paffage through the eye of the hammer. The firft time of removing the fcoria is about 20 minutes from the kindling of the fire, the fecond time is about 40 minutes after the firft, and the third time is near the end of the operation.

The mafs is then removed from the hearth, and put upon the ground of the forge, where it is cleanfed from fcoria, and beat into a more uniform fhape. It is then placed on an anvil, where, by being forged, it receives a form nearly cubical. This mafs is to be divided into five, fix, or more pieces, by means of a wedge; and thefe are to be heated and forged till they are reduced to the form of the bars commonly fold.

In fome forges, the iron is fufed only once, and in others it fuffers three fufions, by which it is faid to be rendered

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rendered very pure. Where only one fusion is practised, it is called the *French method*. In this, no greater quantity of iron is fused at once than is sufficient to make one bar. The fire-place is of considerably less dimensions, and especially is less deep, than in the German method above described. The fire is also more intense, and the proportion of fuel consumed to the iron is greater. The iron, when melted, is not kept in a state of ebullition as is above described; but this ebullition is prevented by stirring the fluid mass with an iron bar, till it is coagulated, and becomes solid

By these operations, fusion and forging, the iron loses about $\frac{3}{11}$ parts of its former weight, sometimes more and sometimes less, according to the quality of the cast-iron employed; it is purified from the vitreous and earthy parts which were intermixed with it, its metallic particles are more closely compacted, its texture is changed, and it is rendered more dense, soft, and malleable, tough, and difficultly fusible.

The degrees, however, of these qualities vary much in different kinds of iron. Thus some iron is tough and malleable, both when it is hot and when it is cold. This is the best and most useful iron. It may be known generally by the equable surface of the forged bar, which is free from transverse fissures or cracks in the edges, and by a clear, white, small-grained, or rather fibrous texture. Another kind is tough when it is heated, but brittle when it is cold. This is called *cold-short* iron; and is generally known by a texture consisting of large, shining plates, without any fibres. It is less liable to rust than other iron. A third kind of iron, called *red-short*, is brittle when hot, and malleable when cold. On the surface and edges of the bars of this kind of iron, transverse cracks or fissures may be seen; and its internal colour is dull and dark. It is very liable to rust. Lastly, some iron is brittle both when hot and when cold.

Most authors agree, that the red-short quality of iron proceeds from some sulphur or vitriolic acid being contained in it, because sulphur is known to produce this effect when added to iron, and because the iron obtained from pyritous and other sulphurated ores has generally this quality.

The cause of the cold-short quality of iron is not so well ascertained. Some imagine, that it proceeds from a mixture of arsenic or of antimony. But this opinion seems to be improbable, when we consider that these metallic substances may in a great measure be dissipated by roasting, whereas the ores which yield a cold-short iron are injured by much roasting; that no arsenic or antimony are observable in most, if in any, of these ores; and lastly, that these semimetals would render the iron brittle both when hot and when cold. Cramer and other authors impute this vicious quality to a mixture of unmetallic earth or vitreous matter; and affirm, that it may be destroyed by cementation with phlogiston, and by forging. And lastly, others ascribe the cold-short quality of iron to a defect of phlogiston, or, as Swedenborgius says, of sulphur. To ascertain the causes of the bad qualities of iron, and to discover practical remedies, are still desiderata in metallurgy.

In one bar frequently two or more different kinds of iron may be observed, which run all along its whole length, and scarcely a bar is ever found of entirely pure and homogeneous iron. This difference probably proceeds from the practice we have mentioned of mixing different kinds of ores together, in the smelting; and also from the practice of mixing two or more pigs of cast iron of different qualities in the finery of these; by which means, the red-short and cold-short qualities of the different kinds are not, as we have already remarked, mutually counteracted or destroyed by each other, but each of these qualities is diminished in the mixed mass of iron, as much as this mass is larger than the part of the mass originally possessed of that quality: that is, if equal parts of red-short and of cold-short iron be mixed together, the mixed mass will be only half as red short as the former part, and half as cold-short as the latter. For these different kinds of iron seem as if they were only capable of being interwoven and diffused through each other, but not of being intimately united or combined.

The quality of forged iron may be known by the texture which appears on breaking a bar. The best and toughest iron is that which has the most fibrous texture, and is of a clear greyish colour. This fibrous appearance is given by the resistance which the particles of the iron make to their rupture. The next best iron is that whose texture consists of clear, whitish, small grains, intermixed with fibres. These two kinds are malleable, both when hot and when cold, and have great tenacity. *Cold-short iron* is known by a texture consisting of large, shining plates, without fibres: and *red-short iron* is distinguished by its dark dull colour, and by the transverse cracks and fissures on the surface and edges of the bars. The quality of iron may be much improved by violent compression, as by forging and rolling; especially when it is not long exposed to too violent heat, which is known to injure, and at length to destroy, its metallic properties.

For the conversion of iron into *steel*, see the article Steel.

Smelting of Tin Ores.

Sect. VI. *Of the Smelting of Tin Ores.*

The tin-ores commonly smelted are those which consist of calx of tin combined with calx of arsenic and sometimes with calx of iron. These are either pure, as the tin-grains, or intermixed with spars, stones, pyrites, ores of copper, iron, or of other metals.

The impure ores must be cleansed as much as is possible from all heterogeneous matters. This cleansing is more necessary in ores of tin than of any other metal; because in the smelting of tin-ores a less intense heat must be given than is sufficient for the scorification of earthy matters; lest the tin be calcined. Tin-ores previously bruised may be cleansed by washing, for which operation their great weight and hardness render them well adapted. If they be intermixed with very hard stones or ferruginous ores, a slight roasting will render these impure matters more friable, and consequently fitter to be separated from the tin-ores. Sometimes these operations, the roasting, contusion, and lotion, must be repeated. By roasting, the ferruginous particles are so far revived, that they may be separated by magnets.

Smelting of Ores of Lead.

The ore, thus cleanfed from adhering heterogeneous matters, is to be roafted in an oven or reverberatory furnace, with a fire rather intenfe than long continued; during which it muft be frequently ftirred to prevent its fufion. By this operation, the arfenic is expelled, and in fome works is collected in chambers built purpofely above the calcining furnace.

Laftly, the ore cleanfed and roafted is to be fufed, and reduced to a metallic ftate. In this fufion, attention muft be given to the following particulars. 1. No more heat is to be applied than is fufficient for the reduction of the ore; becaufe this metal is fufible with very little heat, and is very eafily calcinable. 2. To prevent this calcination of the reduced metal, a larger quantity of charcoal is ufed in this than in moft other fufions. 3. The fcoria muft be frequently removed, left fome of the tin fhould be involved in it; and the melted metal muft be covered with charcoal powder, to prevent the calcination of its furface. 4. No flux or other fubftance, excepting the fcoria of former fmeltings which contains fome tin, are to be added, to facilitate the fufion.

Sect. VII. *Smelting of Ores of Lead.*

Ores of lead are either pure, that is, containing no mixture of other metal; or they are mixed with filver, copper, or pyrites. The methods of treating ores of lead containing filver and copper, are defcribed in the fections of *Smelting of Ores of Silver* and *of Copper*; and in the former of thefe an inftance is given of the method of fmelting the ore of Ramelfberg, which contains all thefe three metals.

Pure ores of lead, and thofe which contain fo fmall a quantity only of filver as not to compenfate for the expence of extracting the nobler metal, may be fmelted in furnaces, and by operations fimilar to thofe ufed at Ramelfberg, or in the following methods. 1. From the lead-ore of Willach in Carinthia, a great part of the lead is obtained by a kind of eliquation, during the roafting of the ore. For this purpofe, the ore is thrown upon feveral ftrata or layers of wood, placed in a calcining or reverberatory furnace. By kindling this wood, a great part of the lead flows out of the ore, through the layers of fuel, into a bafon placed for its reception. The ore which is thus roafted is beat into fmaller pieces, and expofed to a fecond operation fimilar to the former, by which more metal is eliquated; and the remaining ore is afterwards ground, wafhed, and fmelted, in the ordinary method.

The lead of Willach is the pureft of any known. Schlutter afcribes its great purity to the method ufed in extracting it, by which the moft fufible, and confequently the pureft part of the contained lead, is feparated from any lefs fufible metal which happens to be mixed with it, and which remains in the roafted ore. This method requires a very large quantity of wood.

2. In England, lead ores are fmelted either upon a hearth, or in a reverberatory furnace called *a cupel*.

In the firft of thefe methods, charcoal is employed as fuel, and the fire is excited by bellows. Small quantities of fuel and of ore are thrown alternately and frequently upon the hearth. The fufion is very quickly effected; and the lead flows from the hearth as faft as it is feparated from the ore.

Smelting of Ores of Semi-metal.

3. In the fecond method practifed in England, pit-coal is ufed as fuel. The ore is melted by means of the flame paffing over its furface; its fulphur is burnt and diffipated, while the metal is feparated from the fcoria, and collected at the bottom of the furnace. When the ore is well cleanfed and pure, no addition is requifite; but when it is mixed with calcareous or earthy matrix, a kind of flour or fufible fpar found in the mines is generally added to render the fcoria more fluid, and thereby to affift the precipitation of the metal. When the fufion has been continued about eight hours, a paffage in the fide of the furnace is opened, through which the liquid lead flows into an iron ciftern. But immediately before the lead is allowed to flow out of the furnace, the workmen throw upon the liquid mafs a quantity of flacked quicklime, which renders the fcoria fo thick and tenacious, that it may be drawn out of the furnace by rakes. Schlutter mentions this addition of quicklime in the fmelting of lead ores in England, but thinks that it is intended to facilitate the fufion of the ores; whereas it really has a contrary effect, and is never added till near the end of the operation, when the fcoria is to be raked from the furface of the metal.

Sect. VIII. *Of the Smelting of Ores of Semi-metals.*

Antimony is obtained by a kind of eliquation from the minerals containing it, as is defcribed in the article Antimony; and the regulus of antimony is procured from antimony, by the proceffes defcribed in the fame article, and in the article *Regulus of Antimony*.

Arfenic, *faffre*, and *bifmuth*, are obtained generally from one ore, namely, that called *cobalt*. The arfenic of the ore is feparated by roafting, and adheres to the internal furface of a chimney, which is extended horizontally about 200 or 300 feet in length, and in the fides of which are feveral doors, by means of which the arfenic, when the operation is finifhed, may be fwept out and collected. Thefe chimneys are generally bent in a zig zag direction, that they may better retard and ftop the arfenical flowers. Thefe flowers are of various colours, white, grey, red, yellow, according to the quantity of fulphur or other impurity with which they happen to be mixed. They are afterwards purified by repeated fublimations; while fome alkaline or other fubftances are added to detain the fulphur, and to affift the purification.

In the fame roafting of the ore by which the arfenic is expelled, the bifmuth, or at leaft the greateft part of this femimetal which is contained in the ore, being very fufible, and having no difpofition to unite with the regulus of cobalt, which remains in the ore, is feparated by eliquation.

The remaining part of the roafted ore confifts chiefly of calx of regulus of cobalt, which not being volatile, as the arfenic is, nor fo eafily fufible as bifmuth is, has been neither volatilized nor melted. It contains alfo fome bifmuth, and a fmall quantity of arfenic, together

Smelting of Ores of Semi-metals.

gether with any silver or other fixed metal which happened to be contained in the ore. This roasted ore being reduced to a fine powder, and mixed with three or four times its weight of fine sand, is the powder called *saffre* or *zaffre*. Or the roasted ore is sometimes fused with about thrice its quantity of pure sand and as much pure pot-ash, by which a blue glass, called *smalt*, is produced; and a metallic mass, called *speiss*, is collected at the bottom of the vessel in which the matters are fused. The metallic mass or speiss is composed of very different substances, according to the contents of the ore and the methods of treating it. The matters which it contains at different times are, nickel, regulus of cobalt, bismuth, arsenic, sulphur, copper, and silver.

The Zaffre.

The Smalt.

Bismuth is seldom procured from any other ores but that of cobalt. It might, however, be extracted from its proper ores, if a sufficient quantity of these were found, by the same method by which it is obtained from cobalt, namely, by eliquation.

Mercury, when native, and inveloped in much earthy or other matter, from which it cannot be separated merely by washing, is distilled either by ascent or by descent. When it is mineralised by sulphur, that is, when it is contained in cinnabar, some intermediate substance, as quicklime or iron, must be added in the distillation, to disengage it from the sulphur.

The rich ore of Almaden in Spain is a cinnabar, with which a calcareous stone happens to be so blended, that no addition is required to disengage the mercury from the sulphur. The distillation is there performed in a furnace consisting of two cavities, one of which is placed above another. The lower cavity is the fire-place, and contains the fuel, resting upon a grate, through the bars of which the air enters, maintains the fire, and passes into a chimney, placed at one side of the fire-place immediately above the door thro' which fuel is to be introduced. The roof of this fire-place, which is vaulted and pierced with several holes, is also the floor of the upper cavity. Into this upper cavity, the mineral from which mercury is to be distilled is introduced, through a door in one of the sides of the furnace. In the opposite wall of this cavity are eight openings, all at the same height. To each of these openings is adapted a file of aludels connected and luted together, extending 60 feet in length. These aludels, which are earthen vessels open at each end, and wider in the middle than at either extremity, are supported upon an inclined terras; and the aludel of each file, that is most distant from the furnace, terminates in a chamber built of bricks, which has two doors and two chimneys.

When the upper cavity is filled sufficiently with the mineral, a fire is made below, which is continued during 12 or 14 hours. The heat is communicated thro' the holes of the vaulted roof of the fire-place to the mineral in the upper cavity, by which means the mercury is volatilised, and its vapour passes into the aludels, where much of it is condensed, and the rest is discharged into the brick-chamber, in which it circulates till it also is condensed. If any air or smoke passes through the aludels along with the vapour of the mercury, they escape through the two chimneys of the chamber. Three days after the operation, when the apparatus is sufficiently cooled, the aludels are unluted, the doors of the chamber are opened, and the mercury is collected.

Metamorphosis, Metaphor.

METAMORPHOSIS, in general, denotes the changing of something into a different form; in which sense it includes the transformation of insects, as well as the mythological changes related by the ancient poets.

Mythological metamorphoses were held to be of two kinds, apparent and real: thus, that of Jupiter into a bull, was only apparent; whereas that of Lycaon into a wolf, was supposed to be real

Most of the ancient metamorphoses include some allegorical meaning, relating either to physics or morality: some authors are even of opinion that a great part of the ancient philosophy is couched under them; and Lord Bacon and Dr Hook have attempted to unriddle several of them.

METAPHOR, in rhetoric. See ORATORY, n° 50.

METAPHOR *and Allegory*, in poetry.—A metaphor differs from a simile, in form only, not in substance: in a simile the two subjects are kept distinct in the expression, as well as in the thought; in a metaphor, the two subjects are kept distinct in the thought only, not in the expression. A hero resembles a lion, and upon that resemblance many similies have been raised by Homer and other poets. But instead of resembling a lion, let us take the aid of the imagination, and feign or figure the hero to be a lion, by that variation the simile is converted into a metaphor; which is carried on by describing all the qualities of a lion that resemble those of the hero. The fundamental pleasure here, that of resemblance, belongs to the thought. An additional pleasure arises from the expression: the poet, by figuring his hero to be a lion, goes on to describe the lion in appearance, but in reality the hero; and his description is peculiarly beautiful, by expressing the virtues and qualities of the hero in new terms, which, properly speaking, belong not to him, but to the lion. This will better be understood by examples. A family connected with a common parent, resembles a tree, the trunk and branches of which are connected with a common root: but let us suppose, that a family is figured, not barely to be like a tree, but to be a tree; and then the simile will be converted into a metaphor, in the following manner:

Metaphor.

> Edward's sev'n sons, whereof thyself art one,
> Were sev'n fair branches, springing from one root;
> Some of these branches by the dest'nies cut:
> But Thomas, my dear lord, my life, my Glo'ster,
> One flourishing branch of his most royal root,
> Is hack'd down, and his summer-leaves all faded,
> By Envy's hand and Murder's bloody axe.
>
> *Richard* II. *act.* i. *sc.* 3.

Figuring human life to be a voyage at sea:

> There is a tide in the affairs of men,
> Which, taken at the flood, leads on to Fortune:

Omitted, all the voyage of their life
Is bound in ſhallows and in miſeries.
On ſuch a full ſea are we now afloat;
And we muſt take the current when it ſerves,
Or loſe our ventures. *Julius Cæſar, act* iv. *ſc.* 5.

Figuring glory and honour to be a garland of flowers:
Hotſpur. ———— ——— -Wou'd to heav'n,
Thy name in arms were now as great as mine!
Pr.Henry. I'll make it greater ere I part from thee;
And all the budding honours on thy creſt
I'll crop, to make a garland for my head.
Firſt part of Henry IV. *act* v. *ſc.* 9.

Figuring a man who hath acquired great reputation and honour to be a tree full of fruit:
—————— Oh, boys, this ſtory
The world may read in me; my body's mark'd
With Roman ſwords; and my report was once
Firſt with the beſt of note. Cymbeline lov'd me;
And when a ſoldier was the theme, my name
Was not far off; then was I as a tree,
Whoſe boughs did bend with fruit. But in one night,
A ſtorm or robbery, call it what you will,
Shook down my mellow hangings, nay my leaves;
And left me bare to wither.
Cymbeline, act iii. *ſc.* 3.

"Bleſt be thy ſoul, thou king of ſhells, ſaid Swaran of the dark-brown ſhield. In peace, thou art the gale of ſpring; in war, the mountain-ſtorm. Take now my hand in friendſhip, thou noble king of Morven."
Fingal.

"Thou dwelleſt in the ſoul of Malvina, ſon of mighty Oſſian. My ſighs ariſe with the beam of the eaſt: my tears deſcend with the drops of night. I was a lovely tree in thy preſence, Oſcar, with all my branches round me: but thy death came like a blaſt from the deſart, and laid my green head low; the ſpring returned with its ſhowers, but no leaf of mine aroſe."
Fingal.

An *allegory* differs from a metaphor; and a *figure of ſpeech* differs from both. A metaphor is defined above to be an act of the imagination, figuring one thing to be another. An allegory requires no ſuch operation, nor is one thing figured to be another: it conſiſts in chooſing a ſubject having properties or circumſtances reſembling thoſe of the principal ſubject: and the former is deſcribed in ſuch a manner as to repreſent the latter: the ſubject thus repreſented is kept out of view: we are left to diſcover it by reflection; and we are pleaſed with the diſcovery, becauſe it is our own work. (See the word ALLEGORY.) Quintilian gives the following inſtance of an allegory,

O navis, réferent in mare te novi
Fluctus. O quid agis? fortiter occupa portum.
Horat. lib. i. *ode* 14.

and explains it elegantly in the following words: "Totuſque ille Horatii locus, quo navim pro republica, fluctuum tempeſtates pro bellis civilibus, portum pro pace atque concordia, dicit."

In a *figure of ſpeech*, there is no fiction of the imagination employed, as in a metaphor; nor a repreſentative ſubject introduced, as in an allegory. This figure, as its name implies, regards the expreſſion only, not the thought; and it may be defined, the uſing a word in a ſenſe different from what is proper to it.— Thus youth, or the beginning of life, is expreſſed figuratively by *morning of life:* morning is the beginning of the day; and in that view it is employed to ſignify the beginning of any other ſeries, life eſpecially, the progreſs of which is reckoned by days. See FIGURE *of Speech.*

Metaphor and *allegory* are ſo much connected, that it ſeemed proper to handle them together: the rules particularly for diſtinguiſhing the good from the bad, are common to both. We ſhall therefore proceed to theſe rules, after adding ſome examples to illuſtrate the nature of an *allegory*, which, with a view to this article, was but ſlightly illuſtrated under its proper name.

Horace, ſpeaking of his love to Pyrrha, which was now extinguiſhed, expreſſeth himſelf thus:
————— Me tabulâ ſacer
Votivâ paries indicat uvida
Suſpendiſſe potenti
Veſtimenta maris Deo. *Carm. lib.* i. *ode* 5.
Again:
Phœbus volentem prælia me loqui,
Victas et urbes, increpuit, lyrâ
Ne parva Tyrrhenum per æquor
Vela darem. *Carm. lib.* iv. *ode* 15.

Queen. Great Lords, wiſe men ne'er ſit and wail their loſs,
But cheerly ſeek how to redreſs their harms.
What though the maſt be now blown overboard,
The cable broke, the holding-anchor loſt,
And half our ſailors ſwallowed in the flood!
Yet lives our pilot ſtill. Is't meet that he
Should leave the helm, and, like a fearful lad,
With tearful eyes add water to the ſea,
And give more ſtrength to that which hath too much;
While in his moan the ſhip ſplits on the rock,
Which induſtry and courage might have ſav'd?
Ah, what a ſhame! ah, what a fault were this!
Third part of Henry VI. *act.* v. *ſc.* 5.

Oroonoko. Ha! thou haſt rous'd
The lion in his den; he ſtalks abroad,
And the wide foreſt trembles at his roar.
I find the danger now. *Oroonoko, act* iii. *ſc.* 2.

"My well-beloved hath a vineyard in a very fruitful hill. He fenced it, gathered out the ſtones thereof, planted it with the choiceſt vine, built a tower in the midſt of it, and alſo made a wine-preſs therein; he looked that it ſhould bring forth grapes, and it brought forth wild grapes. And now, O inhabitants of Jeruſalem, and men of Judah, judge, I pray you, betwixt me and my vineyard. What could have been done more to my vineyard, that I have not done? Wherefore, when I looked that it ſhould bring forth grapes, brought it forth wild grapes. And now go to, I will tell you what I will do to my vineyard: I will take away the hedge thereof, and it ſhall be eaten up; and break down the wall thereof, and it ſhall be trodden down. And I will lay it waſte: it ſhall not be pruned, nor digged, but there ſhall come up briars and thorns: I will alſo command the clouds that they rain no rain upon it. For the vineyard of the Lord of hoſts is the houſe of Iſrael, and the men of Judah his pleaſant plant." *Iſaiah*, v. 1.

 The

The rules that govern metaphors and allegories are of two kinds. The construction of these figures comes under the first kind: the propriety or impropriety of introduction comes under the other.— To begin with rules of the first kind; some of which coincide with those already given for similies; some are peculiar to metaphors and allegories.

In the first place, it has been observed, that a simile cannot be agreeable where the resemblance is either too strong or too faint. This holds equally in metaphor and allegory; and the reason is the same in all. In the following instances, the resemblance is too faint to be agreeable.

Malcolm. ——— But there's no bottom, none,
In my voluptuousness: your wives, your daughters,
Your matrons, and your maids, could not fill up
The cistern of my lust. *Macbeth, Act* iv. *sc.* 4.

The best way to judge of this metaphor, is to convert it into a simile: which would be bad, because there is scarce any resemblance between lust and a cistern, or betwixt enormous lust and a large cistern.

Again:

He cannot buckle his distemper'd cause
Within the belt of rule. *Macbeth, Act* v. *sc.* 2.

There is no resemblance between a distempered cause and any body that can be confined within a belt.

Again:

Steep me in poverty to the very lips.
Othello, Act iv. *sc.* 9.

Poverty here must be conceived a fluid, which it resembles not in any manner.

Speaking to Bolingbroke banish'd for six years:

The sullen passage of thy weary steps
Esteem a soil, wherein thou art to set
The precious jewel of thy home-return.
Richard II. *Act* ii. *sc.* 6.

Again:

Here is a letter, lady,
And every word in it a gaping wound
Issuing life-blood.
Merchant of Venice, Act iii. *sc.* 3.

Tantæ *molis* erat Romanam condere gentem.
Æneid. i. 37.

The following metaphor is strained beyond all endurance: Timur-bec, known to us by the name of *Tamerlane the Great*, writes to Bajazet emperor of the Ottomans in the following terms:

"Where is the monarch who dares resist us? where is the potentate who doth not glory in being numbered among our attendants? As for thee, descended from a Turcoman sailor, since the vessel of thy unbounded ambition hath been wreck'd in the gulf of thy self-love, it would be proper, that thou shouldst take in the sails of thy temerity, and cast the anchor of repentance in the port of sincerity and justice, which is the port of safety; lest the tempest of our vengeance make thee perish in the sea of the punishment thou deservest."

Such strained figures, as observed above, are not unfrequent in the first dawn of refinement; the mind in a new enjoyment knows no bounds, and is generally carried to excess, till taste and experience discover the proper limits.

Secondly, whatever resemblance subjects may have, it is wrong to put one for another, where they bear no mutual proportion. Upon comparing a very high to a very low subject, the simile takes on an air of burlesque: and the same will be the effect where the one is imagined to be the other, as in a metaphor; or made to represent the other, as in an allegory.

Thirdly, These figures, a metaphor especially, ought not to be crowded with many minute circumstances; for in that case it is scarcely possible to avoid obscurity. A metaphor above all ought to be short: it is difficult, for any time, to support a lively image of a thing being what we know it is not; and for that reason, a metaphor drawn out to any length, instead of illustrating or enlivening the principal subject, becomes disagreeable by overstraining the mind. Here Cowley is extremely licentious: take the following instance.

Great and wise conqu'ror, who, where-e'er
Thou com'st, dost fortify, and settle there!
Who canst defend as well as get;
And never hadst one quarter beat up yet;
Now thou art in, thou ne'er wilt part
With one inch of my vanquish'd heart;
For since thou tookst it by assault from me,
'Tis garrison'd so strong with thoughts of thee,
It fears no beauteous enemy.

For the same reason, however agreeable long allegories may at first be by their novelty, they never afford any lasting pleasure: witness the *Fairy Queen*, which with great power of expression, variety of images, and melody of versification, is scarce ever read a second time.

In the fourth place, the comparison carried on in a simile, being in a metaphor sunk by imagining the principal subject to be that very thing which it only resembles; an opportunity is furnished to describe it in terms taken strictly or literally with respect to its imagined nature. This suggests another rule, That in constructing a metaphor, the writer ought to make use of such words only as are applicable literally to the imagined nature of his subject: figurative words ought carefully to be avoided; for such complicated figures, instead of setting the principal subject in a strong light, involve it in a cloud, and it is well if the reader, without rejecting by the lump, endeavour patiently to gather the plain meaning, regardless of the figures:

A stubborn and unconquerable flame
Creeps in his veins, and drinks the streams of life.
Lady Jane Gray, Act i. *sc.* 1.

Copied from Ovid,

Sorbent avidæ præcordia flammæ.
Metamorph. lib. ix. 172.

Let us analyse this expression. That a fever may be imagined a flame, we admit: though more than one step is necessary to come at the resemblance: a fever, by heating the body, resembles fire; and it is no stretch to imagine a fever to be a fire: again, by a figure of speech, Metaphor. speech, flame may be put for fire, because they are commonly conjoined; and therefore a fever may be termed a *flame*. But now admitting a fever to be a flame, its effects ought to be explained in words that agree literally to a flame. This rule is not observed here; for a flame drinks figuratively only, not properly.

King Henry to his son prince Henry:
Thou hid'st a thousand daggers in thy thoughts,
Which thou hast whetted on thy stony heart
To stab at half an hour of my frail life.
Second part Henry IV. *Act* iv. *sc.* 11.

Such faulty metaphors are pleasantly ridiculed in the *Rehearsal:*

" *Physician.* Sir, to conclude, the place you fill has more than amply exacted the talents of a wary pilot; and all these threatening storms, which, like impregnate clouds, hover o'er our heads, will, when they once are grasp'd but by the eye of reason, melt into fruitful showers of blessings on the people.

" *Bayes.* Pray mark that allegory. Is not that good?

" *Johnson.* Yes, that grasping of a storm with the eye is admirable." *Act* ii. *sc.* 1.

Fifthly, the jumbling different metaphors in the same sentence, beginning with one metaphor and ending with another, commonly called a *mixt metaphor*, ought never to be indulged.

K. Henry ——Will you again unknit
This churlish knot of all abhorred war,
And move in that obedient orb again,
Where you did give a fair and natural light?
First part Henry VI. *Act* v. *sc.* 1.

Whether 'tis nobler in the mind, to suffer
The stings and arrows of outrageous fortune;
Or to take arms against a sea of troubles,
And by opposing end them.
Hamlet, Act iii. *sc.* 2.

In the sixth place, It is unpleasant to join different metaphors in the same period, even where they are preserved distinct: for when the subject is imagined to be first one thing and then another in the same period without interval, the mind is distracted by the rapid transition; and when the imagination is put on such hard duty, its images are too faint to produce any good effect:

At regina gravi jamdudum saucia cura,
Vulnus alit venis, et cæco carpitur igni.
Æneid. iv. 1.

————Est mollis flamma medullas
Interea, et tacitum vivit sub pectore vulnus.
Æneid. iv. 66.

Motum ex Metello consule civicum,
Bellique causas, et vitia, et modos,
Ludumque fortunæ, gravesque
Principum amicitias, et arma
Nondum expiatis uncta cruoribus,
Periculosæ plenum opus aleæ,
Tractas, et incedis per ignes
Subpositos cineri doloso.
Horat. Carm. lib. ii. *ode* 1.

In the last place, It is still worse to jumble together metaphorical and natural expression, so as that the period must be understood in part metaphorically, in part literally; for the imagination cannot follow with sufficient ease changes so sudden and unprepared: a metaphor begun and not carried on, hath no beauty; and instead of light, there is nothing but obscurity and confusion. Instances of such incorrect composition are without number: we shall, for a specimen, select a few from different authors. Speaking of Britain.

This precious stone set in the sea,
Which serves it in the office of a wall,
Or as a moat defensive to a house
Against the envy of less happier lands.
Richard II. *act* ii. *sc.* 1.

In the first line Britain is figured to be a precious stone: in the following line, Britain, divested of her metaphorical dress, is presented to the reader in her natural appearance.

These growing feathers pluck'd from Cæsar's wing,
Will make him fly an ordinary pitch
Who else would soar above the view of men,
And keep us all in servile fearfulness.
Julius Cæsar, act i. *sc.* 1.

Rebus angustis animosus atque
Fortis adpare: sapienter idem
Contrahes vento nimium secu
Turgida vela. *Hor.*

The following is a miserable jumble of expressions, arising from an unsteady view of the subject, between its figurative and natural appearance:

But now from gath'ring clouds destruction pours,
Which ruins with mad rage our halcyon hours:
Mists from black jealousies the tempest form,
Whilst late divisions reinforce the storm.
Dispensary, canto iii.

To thee the world its present homage pays,
The harvest early, but mature the praise.
Pope's imitation of Horace, B. ii.

Oui, sa pudeur ne'st que franche grimace,
Qu'une ombre de vertu qui garde mal la place,
Et qui s'evanouit, comme l'on peut savoir,
Aux rayons du soleil qu'une bourse vait voir.
Moliere, L'Etourdi, act iii. *sc.* 2.

Et son feu, de pourvû de sense et de lecture,
S'éteint à chaque pas, saut de nourriture.
Boileau, L'art poetique, chant. iii. l. 319.

Dryden, in his dedication of the translation of *Juvenal,* says, " When thus, as I may say, before the use of the loadstone, or knowledge of the compass, I was sailing in a vast ocean, without other help than the pole-star of the ancients, and the rules of the French stage among the moderns, &c."

" There is a time when factions, by the vehemence of their own fermentation, stun and disable one another." *Bolingbroke.*

This fault of jumbling the figure and plain expression into one confused mass, is not less common in allegory than in metaphor.

Take

Take the following examples:

——————Heu! quoties fidem,
Mutatosque Deos flebit, et aspera
Nigris æquora ventis
Emirabitur insolens.
Qui nunc te fruitur credulus aureâ:
Qui semper vacuam, semper amabilem
Sperat, nescius auræ
Fallacis. *Horat. Carm. lib.* i. *ode* 5.

Pour moi sur cette mer, qu'ici bas nous courons,
Je songe à me pourvoir d'esquif et d'avirons,
A regler mes desires, à prévenir l'orage,
Et sauver, s'il se peut, ma Raison du naufrage.
Boileau, epitre 5.

Lord Halifax, speaking of the ancient fabulists: "They (says he) wrote in signs, and spoke in parables: all their fables carry a double meaning: the story is one, and entire; the characters the same throughout; not broken or changed, and always conformable to the nature of the creature they introduce. They never tell you, that the dog which snapped at a shadow, lost his troop of horse; that would be unintelligble. This is his (Dryden's) new way of telling a story, and confounding the moral and the fable together." After instancing from the hind and panther, he goes on thus: "What relation has the hind to our Saviour? or what notion have we of a panther's Bible? If you say he means the church, how does the church feed on lawns, or range in the forest? Let it be always a church, or always a cloven-footed beast; for we cannot bear his shifting the scene every line."

A few words more upon allegory. Nothing gives greater pleasure than this figure, when the representative subject bears a strong analogy, in all its circumstances, to that which is represented: but the choice is seldom so lucky; the analogy being generally so faint and obscure, as to puzzle and not please. An allegory is still more difficult in painting than in poetry: the former can show no resemblance but what appears to the eye; the latter hath many other resources for showing the resemblance. And therefore, with respect to what the Abbé du Bos terms *mixt allegorical compositions*, these may do in poetry; because, in writing, the allegory can easily be distinguished from the historical part: no person, for example, mistakes Virgil's Fame for a real being. But such a mixture in a picture is intolerable; because in a picture the objects must appear all of the same kind, wholly real or wholly emblematical. For this reason, the history of Mary de Medicis, in the palace of Luxembourg, painted by Rubens, is unpleasant by a perpetual jumble of real and allegorical personages, which produce a discordance of parts, and an obscurity upon the whole: witness, in particular, the tablature representing the arrival of Mary de Medicis at Marseilles; where, together with the real personages, the Nereids and Tritons appear sounding their shells: such a mixture of fiction and reality in the same group, is strangely absurd. The picture of Alexander and Roxana, described by Lucian, is gay and fanciful; but it suffers by the allegorical figures. It is not in the wit of man to invent an allegorical representation deviating farther from any shadow of resemblance, than one exhibited by Louis XIV. anno 1664; in which an enormous chariot, intended to represent that of the sun, is dragged along, surrounded with men and women, representing the four ages of the world, the celestial signs, the seasons, the hours, &c. a monstrous composition, and yet scarce more absurd than Guido's tablature of Aurora.

In an allegory, as well as in a metaphor, terms ought to be chosen that properly and literally are applicable to the representative subject: nor ought any circumstance to be added that is not proper to the representative subject, however justly it may be applicable properly or figuratively to the principal. The following allegory is therefore faulty:

Ferus et Cupido,
Semper ardentes acuens sagittas
Cote *cruentâ*. *Horat. lib.* ii. *ode* 8.

For though blood may suggest the cruelty of love, it is an improper or immaterial circumstance in the representative subject: water, not blood, is proper for a whetstone.

We proceed to the next head, which is, to examine in what circumstances these figures are proper, in what improper. This inquiry is not altogether superseded by what is said upon the same subject in the article Comparison; because, upon trial, it will be found, that a short metaphor or allegory may be proper, where a simile, drawn out to a greater length, and in its nature more solemn, would scarce be relished.

And, in the first place, a metaphor, like a simile, is excluded from common conversation, and from the description of ordinary incidents. Second, in expressing any severe passion that totally occupies the mind, metaphor is unnatural.

The following example, of deep despair, beside the highly figurative style, has more the air of raving than of sense:

Calista. Is it the voice of thunder, or my father?
Madness! confusion! let the storm come on,
Let the tumultuous roar drive all upon me,
Dash my devoted bark; ye surges, break it;
'Tis for my ruin that the tempest rises.
When I am lost, sunk to the bottom low,
Peace shall return, and all be calm again.
Fair Penitent, act 5.

The following metaphor is sweet and lively; but it suits not the fiery temper of Chamont, inflamed with passion: parables are not the language of wrath venting itself without restraint:

Chamont. You took her up a little tender flow'r,
Just sprouted on a bank, which the next frost
Had nipp'd; and with a careful loving hand,
Transplanted her into your own fair garden,
Where the sun always shines: there long she flourish'd,
Grew sweet to sense, and lovely to the eye;
Till at the last a cruel spoiler came,
Cropt this fair rose, and rifled all its sweetness,
Then cast it like a loathsome weed away. *Orph. act* 4.

The following speech, full of imagery, is not natural in grief and dejection of mind.

Gonsalez. O my son! from the blind dotage
Of a father's fondness these ills arose.
For thee I've been ambitious, base, and bloody:

For-

Metaphor.

For thee I've plung'd into this ſea of ſin;
Stemming the tide with only one weak hand,
While t'other bore the crown (to wreathe thy brow),
Whoſe weight has ſunk me ere I reach'd the ſhore.
Mourning Bride, act 5. ſc. 6.

There is an enchanting picture of deep diſtreſs in Macbeth, where Macduff is repreſented lamenting his wife and children, inhumanly murdered by the tyrant. Stung to the heart with the news, he queſtions the meſſenger over and over: not that he doubted the fact, but that his heart revolted againſt ſo cruel a misfortune. After ſtruggling ſome time with his grief, he turns from his wife and children to their ſavage butcher; and then gives vent to his reſentment, but ſtill with manlineſs and dignity:

O, I could play the woman with mine eyes,
And braggart with my tongue. But, gentle Heav'n!
Cut ſhort all intermiſſion, front to front
Bring thou this fiend of Scotland and myſelf;
Within my ſword's length ſet him. If he 'ſcape,
Then Heav'n forgive him too.

Metaphorical expreſſion, indeed, may ſometimes be uſed with grace where a regular ſimile would be intolerable: but there are ſituations ſo ſevere and diſpiriting, as not to admit even the ſlighteſt metaphor. It requires great delicacy of taſte to determine with firmneſs, whether the preſent caſe be of that nature: perhaps it is; yet who could wiſh a ſingle word of this admirable ſcene altered?

But metaphorical language is proper when a man ſtruggles to bear with dignity or decency a misfortune however great; the ſtruggle agitates and animates the mind:

Wolſey. Farewell, a long farewell, to all my greatneſs!
This is the ſtate of man: to day he puts forth
The tender leaves of hope; to-morrow bloſſoms,
And bears his bluſhing honours thick upon him;
The third day comes a froſt, a killing froſt,
And when he thinks, good eaſy man, full ſurely
His greatneſs is a ripening, nips his root,
And then he falls as I do. *Henry VIII. act 3. ſc. 6.*

METAPHRAST, a tranſlator, or perſon who renders an author into another form or another language, word for word.

METAPHYSICS.

1 Definition.

METAPHYSICS has been defined, by a writer deeply read in the ancient philoſophy, "The ſcience of the principles and cauſes of all things exiſting." This definition, we think, extremely proper: and hence it is, that *mind* or intelligence, and eſpecially the *ſupreme intelligence*, which is the cauſe of the univerſe and of every thing which it contains, is the principal ſubject of this ſcience; and hence, too, the ſcience itſelf received its name. Ariſtotle, indeed, who, of all the ancient metaphyſicians whoſe works have come down to us, was unqueſtionably the greateſt, calls this ſcience THE FIRST PHILOSOPHY, as being not only ſuperior, but alſo prior in the order of nature, to the whole circle of the other arts and ſciences But, "what is firſt to nature, is not firſt to man." Nature begins with *cauſes* which produce *effects*. Man begins with *effects*, and by them aſcends to *cauſes*. Thus all human ſtudy and inveſtigation proceed of neceſſity in the reverſe of the natural order of things, from *ſenſible* to *intelligible*, from *body* the effect, to *mind*, which is both the firſt and the final cauſe. Now, PHYSICS being the name given by the Stagyrite to the philoſophy of body, ſome of his interpreters, from this neceſſary courſe of human ſtudies, called that of mind METAPHYSICS, implying by that term, not only that its ſubject is more ſublime and difficult, but alſo that the ſtudy of it would be moſt properly and ſucceſsfully entered upon AFTER THAT OF PHYSICS. To this name, which, though it has ſometimes been treated with ridicule, is abundantly ſignificant, the followers of Ariſtotle were led by their maſter, who, to the books in which he pretends to elevate the mind above things corporeal to the contemplation of God and things ſpiritual, prefixed the Greek words [illegible] (A).

2 Diviſion of the Science into

The ſcience of Metaphyſics has been divided, according to the objects which it conſiders, into ſix principal parts, which are called, 1. *Ontology*; 2. *Coſmology*; 3. *Anthropoſophy*; 4. *Pſychology*; 5. *Pneumatology*; and, 6. *Metaphyſical theology*.

3 Ontology.

1. That part of the ſcience which is named *ontology*, inveſtigates and explains the nature and eſſence of all beings, as well as the qualities and attributes that eſſentially appertain to them. Hence it has been ſaid that ontology ſhould proceed in its operations from the moſt ſimple ideas; ſuch as do not admit of any other qualities of which they may be compounded. Theſe ſimple ideas are of *being*, of *eſſence*, of *ſubſtance*, of *mode*, of *exiſtence* as well with regard to time as place, of a *neceſſary cauſe* of *unity*; the idea of *negation*; the difference between a *being* that is *ſimple* or *compound*, *neceſſary* or *accidental*, *finite* or *infinite*; the ideas of *eſſential* and *abſtract properties*, ſuch as of the *greatneſs*, *perfection*, and *goodneſs* of *beings*, &c. The buſineſs therefore of ontology, is to make us acquainted with every kind of being in its nature and eſſential qualities, which diſtinguiſh it from all other beings. This knowledge being once eſtabliſhed on ſimple principles, juſt conſequences may thence be drawn, and thoſe things proved after which the metaphyſician enquires,

(A) ΤΩΝ ΜΕΤΑ ΤΑ ΦΥΣΙΚΑ. Cujus inſcriptionis hæc ratio eſt, quod in hoc opere ea tractantur quorum theoria poſterior eſt doctrina naturali ſaltem quoad nos, qui a corporum cognitione rerumque caducarum in ſubſtantiarum immaterialium atque immortalium contemplationem provehimur.
Du Val. Synopſ. Doctr. Peripat.

Divisions of the Science

quires, and which is the business of his science to prove.

It is easy to conceive, that even a clear knowledge of beings, and their essential properties, would be still defective and useless to man, if he did not know how to determine and fix his ideas by proper denominations, and consequently to communicate his perceptions to those whom he would instruct, or against whom he is obliged to dispute. To render our ideas therefore intelligible to others, we must have determinate words or denominations for each being, and the qualities of each being; and ontology teaches us those terms which are so necessary to fix our ideas, and to give them the requisite perspicuity and precision, that when we endeavour to extend the sphere of our knowledge, we may not waste our time in disputes about words.

4 Cosmology;

2. Metaphysics, having, in as solid a manner as possible, explained and established the principles above mentioned, continues its enquiries to the second part, which is called *cosmology*, and examines into the essence of the world and all that it contains, its eternal laws; of the nature of matter; of motion; of the nature of tangible bodies, their attributes and adjuncts; and of all that can be known by reasoning and experience. It is also in cosmology that the metaphysicians of this school examine the Leibnitzian system; that is, whether God, in creating the world, must necessarily have created the best world; and if this world be so in fact. In this manner they pursue the argument, from consequence to consequence, to its last resort, frequently with very little advantage to truth and science.

5 Anthroposophy;

3. *Anthroposophy*, or the knowledge of man, forms the third branch of metaphysics. It is subdivided into two parts. The first, which consists in the knowledge of the exterior parts of the human frame, belongs not to this science, but to Anatomy and Physiology. The business of the metaphysician is here to ascertain the nature of those powers by which all the motions essential to life are produced; and to discover, if possible, whether they be corporeal or spiritual. This inquiry leads at the same time to

6 Psychology;

4. *Psychology*; which consists in the knowledge of the intellectual soul in particular: concerning which, the most profound, the most subtile, and most abstract researches, have been made that human reason is capable of; and concerning the substance of which, in spite of all these efforts, it is yet extremely difficult to support any positive opinion with conclusive or probable arguments.

7 Pneumatology;

5. The fifth part of metaphysics is called *pneumatology*. By this term, which has not been long in use, metaphysicians mean the knowledge of all spirits, *angels*, &c. It is easy to conceive what infinite art is necessary to give an account of that, of which nothing positive can ever be known in the present state of human existence. But the metaphysician of this school readily offers to show us, "what is the idea of a spirit; the effective existence of a spirit; what are its general qualities and properties; that there are rational spirits, and that these rational spirits have qualities that are founded in the moral attributes of God:" for this is in so many words what is attempted to be taught in pneumatology.

8 Metaphysical theology.

6. *Metaphysical theology*, which Leibnitz and some others call *theodicy*, is the sixth and last branch of the science of metaphysics. It teaches us the knowledge of the existence of God; to make the most rational suppositions concerning his divine essence, and to form a just idea of his attributes and perfections, and to demonstrate them by abstract reasoning. Theodicy differs from natural theology, in as much as this last borrows, in fact, from theodicy proofs and demonstrations to confirm the existence of a supreme Being: but after having solidly established that great truth, by extending its consequences natural theology teaches us what are the relations and connections that subsist between the supreme Being and men, and what are the duties which result from those relations.

9 This division useless and improper.

We have briefly mentioned these divisions of the science, because they were once prevalent in the schools. The greater part of them, however, appears to us to be not only superfluous, but such as can serve no other purpose than to perplex the mind. The only beings of which we know any thing are mind and body; and we have no reason to think that there are any other beings in the universe. Of bodies indeed there are various kinds, endowed with different properties: and it is extremely probable, that of minds endowed with different powers, the variety may be equally great. Our own minds we know to be united in one system with bodies by which they perform all their operations; and we can demonstrate that there is another Mind, which is independent of all body, and is the cause of all things. Between these there may be numberless orders of minds; but their energies are wholly unknown to us, and therefore they can never become the objects of science.

Mind and body therefore, *i.e.* the minds and bodies which we know to exist, together with their powers and properties, essential and accidental, can alone be the subjects of rational inquiry. We may inquire into the essence of mind and the essence of body, and endeavour to ascertain in what respects they differ. We may examine the nature of different bodies, in order to discover whether all bodies, however modified, have not something in common; and we may consider the properties, relations, and adjuncts of bodies, and endeavour to distinguish those which are accidental from such as appear to be so necessary that without them body itself could not exist. Of minds we cannot make the same comparison. In this part of the science we have not sufficient data for an accurate and complete induction: we can only examine the powers of our own mind; and by probable analogy make some estimate of the powers of superior minds, as observation will help us to guess at the powers of those which are placed beneath us in the scale of existence.

If this be so, Cosmology, as distinguished from Ontology, cannot properly be a branch of Metaphysics. For if mind and body, with their several powers, properties, and adjuncts, compose the universe, it is obvious, that when we have ascertained, as well as we are able to ascertain, the essence of mind and the essence of body, together with the powers and properties of each, and have traced them all to the first cause, we have done every thing in the science of the universe, if we may use the expression, which belongs to

Divisions of the Science. to the province of the metaphysician. The particular laws of motion on the earth and in the planetary system belong to the natural philosopher and astronomer.

In like manner, Anthroposophy, Psychology, and Pneumatology, if they be not words expressive of distinctions where there is no difference, seem to be at least very needlessly disjoined from each other. Of the nature of spirits we can know nothing but from contemplating the powers of our own minds; and the body of man is in the province, not of the metaphysician, but of the anatomist and physiologist. Anthroposophy, psychology, and pneumatology, if they be used to denote our knowledge of all minds except the Supreme, are words of the same import; for of no created minds except our own can we acquire such knowledge as deserves the name of science.

Ontology has sometimes been defined the science of *being in the abstract;* but in the course of our inquiries it will be seen, that *being in the abstract* is a phrase without meaning. Considered as the science of *real beings* and their *properties*, Ontology is a very significant word, of the same import with Metaphysics, comprehending in itself the knowledge of the nature of all things existing. Or if it be thought proper to make a distinction between ontology and theology, the former branch of the science will teach the knowledge of body and created minds, whilst it is the province of the latter to demonstrate the existence and attributes of that mind which is uncreated.

10 Another proposed. Body and mind therefore, with their properties, adjuncts, and powers, comprehend the whole subject of the science of metaphysics: and as we are earlier acquainted with body than with mind, the natural order of conducting our inquiries seems to be, to begin with the former, and thence proceed to the latter. It is however obvious, that if we would pursue these inquiries with any hopes of success, we must first trace human knowledge from its source, ascertain the nature of truth, and show what kind of evidence on each topic to be treated ought to enforce conviction. In this view of the science, metaphysics appears to be divided into three parts; the first treating *of human understanding;* the second, *of body with its adjuncts;* and the third, *of mind with its powers.*

11 Idea and notion explained. Previous to the entering upon such inquiries, some philosophers of great merit have lately thought it expedient to explain the terms which they should have occasion to use. Their conduct is judicious and worthy of imitation; for the objects of metaphysics being, for the most part, such as fall not under the cognisance of the senses, are liable to be differently apprehended by different men, if the meanings of the words by which they are expressed be not ascertained with the utmost precision. We intend, however, to use very few words but in the common acceptation; and we therefore hope, that as terms of science are explained under different words in the Dictionary, to which references are made, we have little or no occasion for swelling the article by previous definitions. There are indeed two words which have given rise to much useless disputation, which yet cannot be banished from speculative philosophy, and which it will therefore be proper here to define. The words to which we allude are *idea* and *notion.* These are very generally considered as synonymous; but we think that much loquacity might have been avoided by assigning to each a determinate signification. We know not any philosopher who made much use of the word *idea* before Plato; but with his mysterious doctrine concerning ideas we have here nothing to do: our present business is to ascertain the precise meaning of the word, which is evidently derived from ειδω to *see*, as the word *notion* is from "nosco, novi, *notum*," and that from γινωσκω, to *know* or *understand.* In the original sense of the two words, therefore, *notion* is more comprehensive than *idea*, because we *know* many things which cannot be *seen.* We have not a doubt, but that at first the word *idea* was employed to denote only those forms of external objects which men contemplate in their imaginations, and which are originally received through the sense of *sight.* Its signification was afterwards extended to the relicts of every sensation, of touch, taste, sound, and smell, as well as of sight; and at last it was confounded with *notion*, which denotes the mental apprehension of whatever may be known. In our use of the word *idea*, except when we quote from others, we shall employ it only to denote that appearance which absent objects of sense make in the memory or imagination (A); and by the word *notion* we shall denote our apprehension or knowledge of spirits, and all such things as, though they be the objects of science, cannot be perceived by the external senses. Having said this, we proceed to our inquiries, beginning with that into human understanding.

(A) In thus restricting the meaning of the word *idea*, we have the honour to agree with the great English Lexicographer.—"He was particularly indignant against the almost universal use of the word *idea* in the sense of *notion* or *opinion*, when it is clear that *idea* can only signify something of which an image may be formed in the mind. We may have an *idea* or *image* of a mountain, a tree, or a building; but we cannot surely have an *idea* or *image* of an *argument* or *proposition.* Yet we hear the sages of the law delivering their *ideas* upon the question under consideration; and the first speakers in parliament entirely coinciding in the *idea*, which has been so ably stated by an honourable member; or representing an *idea* as unconstitutional, and fraught with the most dangerous consequences to a great and free country. This Johnson called *modern cant.*" *Boswell's Life of Johnson.*

PART

Part I. Of HUMAN UNDERSTANDING.

Preliminary Obſervations on the Origin *of our* Ideas *and* Notions.

11 …innate …as or no… …in the …man …nd.

THAT the mind of man has no innate ideas or notions, but comes into the world ignorant of every thing, is a truth which ſince the days of Locke has been very little diſputed. In the firſt book of his Eſſay on the Human Underſtanding, that acute philoſopher has demonſtrated, that the rudiments or firſt principles of all our knowledge are communicated to us by ſenſation; and he has compared the mind, previous to the operation of external objects upon the ſenſes, to a *tabula raſa* or ſheet of white paper. To repeat his arguments would ſwell the article to no purpoſe. There is not a man capable of attending to his own ideas, who can entertain a doubt in what manner he received them. Without the ſenſe of ſight, we could never have known colours; nor ſound, without hearing; nor hardneſs, ſoftneſs, ſmoothneſs, pain, or bodily pleaſure, without touch; nor odours, without ſmell, &c.

Self-evident as theſe facts are, objections have been ſtarted to the inferences drawn from them; and Locke has been accuſed of advancing principles ſubverſive of all diſtinction between truth and falſehood, and favourable of courſe to univerſal ſcepticiſm.—" The firſt book of his Eſſay, which with ſubmiſſion (ſays Dr Beattie*) I think the worſt, tends to eſtabliſh this dangerous doctrine, that the human mind, previous to education and habit, is as ſuſceptible of one impreſſion as of another: a doctrine which, if true, would go near to prove that truth and virtue are no better than human contrivances; or at leaſt that they have nothing permanent in their nature, but may be as changeable as the inclinations and capacities of men; and that there is no ſuch thing as common ſenſe in the world. Surely this is not the doctrine which Mr Locke meant to eſtabliſh." We are ſo thoroughly ſatisfied that it is not, that we cannot help wondering how ſuch inferences could, by a man of learning, genius, and candour, be drawn from any thing which is to be found in the Eſſay on the Human Underſtanding.

* …ſſay on …Nature …Immutability of …uth.

But the Doctor thinks Mr Locke's "ſimile of the mind to white paper one of the moſt unlucky alluſions that could have been choſen; becauſe the human ſoul, when it begins to think, is not extended, nor of a white colour, nor incapable of energy, nor wholly unfurniſhed with ideas, nor as ſuſceptible of one impreſſion or character as of any other:" and it has been obſerved by another objector†, that "on a ſheet of white paper you may write that ſugar is bitter; wormwood ſweet; fire and froſt in every degree pleaſing and ſufferable; that compaſſion and gratitude are baſe; treachery, falſehood, and envy, noble; and that contempt is indifferent to us."

† …Uſher, …ſor of … See a …of Fugitive Pieces …ted for …Davies, …ndon, …4.

All this is true; but we apprehend it is not to the purpoſe. Mr Locke has no where expreſſed himſelf in ſuch a manner as to lead us to ſuppoſe that he believed the ſoul to be extended or coloured; or, when it begins to think, incapable of energy, and wholly unfurniſhed with ideas: but he certainly did believe, that it begins not to think the firſt inſtant of its exiſtence, and that it *acquires* all the ideas of which it is ever poſſeſſed. We may undoubtedly write upon a piece of white paper that ſugar is bitter, and that wormwood is ſweet; but how the capacity of paper to receive the ſymbols of falſe propoſitions ſhould make Mr Locke's compariſon improper or dangerous, we cannot comprehend. Mr Uſher indeed ſays, that it is improper on this account, "that no human art or induſtry is able to make thoſe impreſſions upon the mind: in reſpect of them, the mind diſcovers not a paſſive capacity, but reſiſts them with the force of fate." Does it indeed? does the mind reject the idea of ſugar or of bitterneſs, of contempt or of indifference? May not any man have the *idea* of ſugar and at the ſame time the *idea* of bitterneſs, and compare the one with the other in his mind, as well as the word *ſugar* may be written beſide the word *bitter*, and connected with it on the ſame piece of paper? In all this we perceive nothing that is impoſſible or even difficult. The mind cannot indeed be made to feel that ſugar has the ſame taſte with wormwood; but who ever thought that it could? Not Mr Locke, we ſhall be bold to ſay; nor does his ſimile give the ſmalleſt countenance to ſuch an abſurdity. The author of the Eſſay on the Human Underſtanding underſtood his ſubject too well to imagine that either truth or falſehood could be communicated to paper, or that paper is capable of comparing ideas. Paper is capable of receiving nothing but lines or figures; and it paſſively receives whatever lines or figures we may chooſe to inſcribe on it: yet if a pen be carried over it in a circular direction, the figure impreſſed will not be a ſquare; juſt as, to the mind of one eating ſugar, the taſte communicated is not that of wormwood.

13 …ections …wered.

On a piece of paper a circle may be deſcribed, and cloſe beſide it a ſquare: in like manner an agreeable ſenſation may be communicated to the mind, and immediately afterwards a ſenſation that is diſagreeable. Theſe two ſenſations, or the ideas which they leave behind them, may be compared together; and it is certainly true that no art or induſtry can make them appear ſimilar in the mind: but is it not equally true, that no art or induſtry can make the circle and the ſquare ſimilar on the paper? The paper is ſuſceptible of any ſort of plain figures, and the mind is equally ſuſceptible of any ſort of ideas or ſenſations; but figures diſſimilar cannot be made to coincide, neither can diſcordant ideas be made to agree. Again, one may write upon paper, that "a circle *is* a ſquare," and likewiſe that "a circle *is not* a ſquare:" and both theſe propoſitions may be communicated to the mind by the organs of ſight or of hearing. The paper receives the *words* expreſſive of the falſe as well as thoſe expreſſive of the true propoſition; and the mind receives the *ideas* and *relations* ſignified by the one cluſter of words as well as thoſe ſignified by the other: but in the mind the *idea* of a ſquare is *different* from that of a circle, and on the paper the *figure* of a ſquare is *different* from the *figure* of a circle. The great difference between the mind and the paper is, that *the former* is *conſcious* of its ideas, and *perceives* their agreement or diſagreement; whereas the paper is *not* conſcious of

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the figures drawn upon it, nor perceives any thing about them. But still those figures are what they are; they either agree or disagree on the paper, as well as the ideas either agree or disagree in the mind. It is not in the power of the mind to alter the *ideas* of the square and the circle, nor in the power of the paper to alter the *forms* of these figures.

It appears then, that the principles of Mr Locke, and the comparison by which he illustrates them, have no more tendency to subvert the difference between truth and falsehood, right and wrong, than the passiveness of paper has to subvert the difference between a straight line and a crooked, a circle and a square: and with a view to establish the doctrine of innate ideas and instinctive principles of knowledge, we might with as much propriety ask, Whether it be possible to imagine that any mode of manufacture could make paper of such a nature, as that a pen drawn over it in a circular direction would leave the figure of a square? as that, "Whether it be possible to imagine, that any course of education could ever bring a rational creature to believe that two and two are equal to three?"

14 But all derived from sensation and reflection.

The mind being thus, as we may say, originally white paper, void of all characters, without ideas or notions of any kind, the first question which we have to consider is, Whence and in what manner it derives the materials of all its knowledge? To this question the only answer which can be given is, That it derives them from observation and experience; from observation, either employed upon external objects of sense, or turned inwardly upon its own operations. Our senses, conversant about particular external objects, convey into the mind several distinct perceptions; such as those of *colour*, *figure*, *heat*, *cold*, *bitterness*, *sweetness*, and all those things which are usually called *sensible qualities*. The notions, ideas, or whatever else they may be called, which are acquired in this manner, may be called *sensible knowledge*; and the source of that knowledge is termed *sensation*.

The other fountain from which experience furnishes the understanding with knowledge, is that attention which we are capable of giving to the operations of our own minds when employed about those ideas which were originally suggested by objects of sense. These operations, when the soul comes to reflect on them, furnish us with a set of notions entirely different from the ideas of sense; such as the notions of *perception*, *thinking*, *doubting*, *believing*, *reasoning*, *knowing*, *willing*, and all the different energies and passions of our own minds. Of these operations we are always conscious when we are awake; but it requires, as shall be shown afterwards, no inconsiderable effort to set them, as it were, at a distance, to reflect on them and consider what they are; but when we have made this effort, we acquire notions as distinct, and perhaps more important, than those ideas which we receive by the medium of the senses.

Sensation and reflection then furnish mankind with the first materials of all their knowledge. The mind seems not to have ideas or notions of any kind which it did not receive by one of these ways. By means of the senses it perceives external objects; and by that power which it has of turning its attention upon itself, it discovers the nature and manner of its own operations.

Although the knowledge which we acquire from *reflection* be of equal importance, and perhaps of greater certainty than that which we receive through the medium of the senses, it comes into the mind at a much later period; both because it is impossible that the faculties of the mind should operate without materials, and because it is much more difficult to attend to these operations even while they are going on, than to the objects of sense which solicit our attention. It is for this reason pretty late before children have any notions whatever of the operations of their own minds; and of the greater part of these operations the bulk of mankind have no clear or accurate notions during their whole lives. On the other hand, every human being is so surrounded with bodies, which perpetually and variously affect his senses, that a variety of sensible ideas force an entrance even into the minds of children. In order therefore to trace the procedure of the understanding, and to ascertain the extent and limits of human knowledge, it should seem that we must begin with considering the external senses, that we may discover the manner in which we receive knowledge by means of them, the objects of that knowledge, and its certainty. It is to be observed, however, that though we consider the mind as possessed of many powers or faculties, and inquire first into the nature of that faculty which we conceive to be first exerted, this is done merely for the sake of proceeding in our subject with method and perspicuity. The mind is one simple and undivided being; and in every mental energy it is the whole mind, and not any part or portion of it, that is energetic. On this account, it is impossible to explain even the nature of sensation and perception to him who knows not what is meant by *will* and *understanding*; but to every one who is acquainted with the common import of these words, and who has read the short system of Logic inserted in this Work, we hope that our theory of perception will be intelligible and convincing.

Chap. I. *Of* Sensation *and* Perception.

Sect. I. *Of Sensation.*

15 Sensation by five organs.

The Supreme Being, who made us and placed us in this world, has given us such powers of mind as he saw to be suited to our state and rank in his creation. He has given us the power of perceiving many objects around us: but that power is limited in various ways; and particularly in this, that without the organs of the several senses we perceive no external object. The senses, as every one knows, are five in number, and each communicates its proper sensation. It is by the eyes alone that we see, by the ears that we hear, by the nose that we smell, and by the tongue and palate that we taste; the sense of feeling or touch is spread over the whole body, for we feel equally by our hands and by our feet, &c. To the powers of perception by the senses it is necessary not only that we have all the organs enumerated, but that we have them also in a sound and natural state. There are many disorders of the eye which cause total blindness, as well as others which impair without destroying the power of vision. The same thing is true of the organs of all the other senses.

All this is so well known from experience, that it needs no proof; but it may be worth while to observe, that

Of Senſation.

that it is known from experience only†. For any thing that we know to the contrary, our Creator might have endowed us with the power of perception by a thouſand organs of ſenſe, all different from thoſe which we poſſeſs; and it is certain that he himſelf perceives every thing more perfectly than we do without bodily organs. For it is to be obſerved, that the organs of ſenſe are different from the being which is ſentient.—

† Reid's Eſſays on the Intellectual Powers of Man.

16
Theſe organs themſelves not ſentient.

It is not the eye which ſees, nor the ear which hears; theſe are only the organs by which we ſee and hear. A man cannot ſee the ſatellites of Jupiter but by means of a teleſcope, nor hear a low voice but by means of an ear-trumpet. Does he from this conclude, that it is the teleſcope which ſees thoſe ſatellites, or the trumpet which hears that voice? Such a concluſion would be evidently abſurd. It is no leſs abſurd to conclude that it is the eye which ſees, or the ear which hears. The teleſcope and the trumpet are artificial organs of ſight and of hearing, of which the eye and the ear are natural organs; but the natural organs ſee and hear as little as the artificial.

17
Arguments for ſenſation.

That this is the caſe with reſpect to the eye and the ear, is ſo obvious, that, as far as we know, it has never been denied. But with reſpect to the ſenſes of touch, taſte, and ſmell, the truth at firſt view appears not ſo evident. A celebrated writer has obſerved *, that "after the utmoſt efforts, we find it beyond our power to conceive the flavour of a roſe to exiſt in the mind: we are neceſſarily led to conceive that pleaſure as exiſting in the noſtrils, along with the impreſſion made by the roſe upon that organ (c); and the ſame will be the reſult of experiments with reſpect to every feeling of taſte, touch, and ſmell. Touch (he ſays), affords the moſt ſatisfactory evidence, and philoſophy detects the deluſion." To detect this deluſion requires, indeed, no great depth in philoſophy; for it is ſo far from being true that we are neceſſarily led otherwiſe than by aſſociation, of which the laws ſhall be explained afterwards, to conceive the pleaſure or pain of touch as exiſting at that part of our body upon which the impreſſion is made, that, as every man muſt have obſerved, children previous to experience cannot diſtinguiſh the preciſe place of their bodies which is affected by the touch of any external object. Nay, we believe it will be found upon trial, that if a full grown man, with all the experience of age to guide him, be pricked with a pin on any part of his body which he has ſeldom handled, and never ſeen, he will not readily nor at firſt put his finger upon the wound, nor even come very *near* to the wound. This, however, he would certainly and infallibly do were the ſenſe of touch neceſſarily conceived as exiſting at the organ. To theſe obſervations objections may perhaps be made, which we cannot ſtay to obviate; but the following, we think, will admit of none. We appeal to every man who has experienced that particular ſenſation of touch which Scaliger dignified with the name of a ſixth ſenſe, whether, whilſt thoſe ſenſations were new to him, he was neceſſarily led to conceive them as exiſting at any particular organ. If he was not, it follows undeniably that the organs of ſenſation are different from the being which is ſentient; that it is not the eye which ſees, the ear which hears, the noſtrils which ſmell, the tongue which taſtes, nor any part of the body which feels; and that it is by experience that we learn to aſſociate our ſeveral ſenſations with thoſe organs upon which the impreſſions are made.

* Elements of Criticiſm.

It is, however, certain that we receive no ſenſation from external objects, unleſs when ſome impreſſion is made upon the organ of ſenſe, either by the immediate application of the object itſelf, or by ſome medium which paſſes between the object and the organ †. In two of our ſenſes, viz. *touch* and *taſte*, there muſt be an immediate application of the object to the organ. In the other three the ſenſation is occaſioned by the impreſſion of ſome medium paſſing from the object to the organ. The effluvia of bodies drawn into the noſtrils with the breath are the medium of ſmell; the undulations of the air are the medium of hearing; and the rays of light paſſing from viſible objects to the eye are the medium of ſight. Theſe are facts known from experience to hold univerſally both in men and in brutes. It is likewiſe a law of our nature perfectly known to all who know any thing of anatomy, that in order to actual ſenſation the impreſſions made upon the external organs muſt be communicated to the nerves, and from them to the brain. Firſt, the object, either immediately, or by ſome medium, makes an impreſſion upon the organ; the organ ſerves only as a medium, by which the impreſſion is communicated to the nerves; and the nerves ſerve as a medium to carry it on to the brain. Here the corporeal part ends; at leaſt we can trace it no farther. The reſt is all intellectual.

† Reid's Eſſays on the Intellectual Powers of Man, and Hartley's Obſervations on Man.

18
The brain and nerves neceſſary to ſenſation.

The proof of theſe impreſſions upon the nerves and brain in ſenſation is this, that from many obſervations and experiments it is found, that when the organ of any ſenſe is perfectly ſound, and has the impreſſion made upon it by the object ever ſo ſtrongly, yet if the nerve which ſerves that organ be cut or tied hard, there is no ſenſation; and it is well known that diſorders in the brain deprive us of ſenſation, while both the organ and its nerve are ſound.

19
Proceſs of nature in ſenſation.

There is ſufficient reaſon, therefore, to conclude, that in ſenſation the object produces ſome change in the organ; that from the organ the change proceeds to the nerve, and from the nerve to the brain. Hence it is that we have poſitive ſenſations from negative objects, or mere non-entities, ſuch as *darkneſs*, *blackneſs*, and *vacuity*. For, ſenſation reſulting from changes in the brain, whatever produces any change muſt of courſe

6

(c) Another eminent writer thinks on this ſubject very differently, and in our opinion much more juſtly.—"Suppoſe (ſays Dr Reid) a perſon who never had this ſenſe (viz. *ſmell*) before, to receive it all at once, and to ſmell a roſe; can he perceive any ſimilitude or agreement between the ſmell and the roſe? or indeed between it and any other object whatever? Certainly he cannot. He finds himſelf affected in a new way, he knows not why, or from what cauſe. He is conſcious that he is not the cauſe of it himſelf; but he cannot from the nature of the thing determine whether it be cauſed by body or ſpirit; by ſomething near, or by ſomething at a diſtance. He cannot give it a *place* any more than he can give a place to melancholy or joy; nor can he conceive it to have any exiſtence but when it is ſmelled." *Inquiry into the Human Mind*, ch. 2. ſect. 2.

Of Senſation.

courſe occaſion a new ſenſation: but it is obvious, that the mere abſence of any impreſſion, by the removal of the object which produced it, muſt as neceſſarily cauſe a change in the organ, nerves, and brain, as the preſence of a new impreſſion from a new object. To theſe changes, or that which *immediately* produces them, we give the name of *impreſſions;* becauſe we know not how, in a general manner, to expreſs more properly any change produced by an external cauſe, without ſpecifying the nature of that cauſe. Whether it be preſſure, or attraction, or repulſion, or vibration, or ſomething unknown, for which we have no name, ſtill it may be called an impreſſion.

Sir Iſaac Newton was perhaps the firſt who ſuppoſed that the rays of light falling upon the bottom of the eye excite vibrations in the *tunica retina;* and that thoſe vibrations being propagated along the ſolid fibres of the optic nerves into the brain, cauſe the actual ſenſation of ſeeing. This hypotheſis was adopted by Dr Hartley, applied to the other ſenſes, and ſhown to be at leaſt as probable as any which has yet been invented to account for the perception of external objects by means of the organs of ſenſe. Be this as it may, experience informs us, that whatever be the nature of thoſe impreſſions and changes which are made by external objects upon the ſenſes, nerves, and brain, we have without them no actual ſenſation, and of courſe perceive nothing *ab extra.* Hence it has been

20 In ſenſation the mind is partly active.

ſuppoſed, that the mind is wholly paſſive in ſenſation, and that ſenſation is *neceſſarily* produced by thoſe impreſſions. But this we believe to be a miſtake. Every man who has been attentive to his own thoughts and actions, muſt know inſtances of impreſſions having been certainly made upon his organs of ſenſe without producing any ſenſation, or ſuggeſting to his mind the perception of the particular objects by which the impreſſions were cauſed. He whoſe mind is intenſely employed in any particular purſuit, may have his eyes open upon an object which he does not ſee; or he may not hear the ſound of a clock ſtriking within two yards of him: Nay, we will venture to affirm, that there is hardly one reader of this article to whom ſuch abſences of ſenſation have not often occurred. Now, as there is no reaſon to ſuppoſe, that in the one caſe the undulations of the air, cauſed by the ſtriking of the clock, did not reach his ears, or that in the other the rays of light, reflected from the object, did not fall upon his eyes, which were open to receive them; the only reaſon which can be aſſigned for his not having, in theſe inſtances, had audible and viſible ſenſations, is, that his mind was ſo engaged in ſomething elſe as not to pay to the vibrations in his brain that attention, if we may ſo ſay, without which impreſſions *ab extra* can produce no ſenſation. There are, indeed, ſome impreſſions on the organs of ſenſe ſo violent and ſo ſudden, as to force themſelves upon the mind however employed. Such are thoſe made on the ear by thunder, and on the eye by ſtrong light. In theſe caſes, ſenſation is involuntary and unavoidable; whence we conclude, not that in ſuch inſtances the mind is paſſive or deſtitute of energy, but that by the violent agitation given to the brain, it is rouſed from its reverie, and compelled to give attention. It appears, therefore, that in ſenſation the mind exerts ſome kind of energy; for in nothing but in the ſentient being itſelf can we ſeek for the cauſe why, when all external circumſtances are the ſame, organical impreſſions ſometimes produce ſenſations and ſometimes not; and that cauſe can only be the energy of the mind: what kind of energy, we pretend not to ſay.

Of Per tion

Sect. II. *Of Perception by the Senſes.*

21 Difficu accoun the per tion of object

How the correſpondence is carried on between the thinking principle within us and the material world without us, has always, as Dr Reid obſerves, been found a very difficult problem to thoſe philoſophers who conſider themſelves as obliged to account for every phenomenon in nature. It is, indeed, a problem of which we expect not to ſee a complete ſolution. A few ſteps beyond the vulgar we may certainly go; but the nature of that connection by which the mind and body are united, will probably remain for ever unknown. One queſtion, however, which has employed much of the attention of philoſophers, both ancient and modern, appears to be not wholly unanſwerable. It is, Whether by means of our ſenſes we perceive external objects mediately or immediately; or in other words, Whether ſenſation and perception be one and the ſame thing, or two things ſucceeding each other? On this ſubject, till of late, there appears to have been in the main a great uniformity in the ſentiments of philoſophers, notwithſtanding their variations reſpecting particular points. Of ſome of the moſt eminent of them, we ſhall give the opinions as we find them collected by one * who is well acquainted with their writings, who is thoroughly qualified to eſtimate their reſpective merits, and who cannot be ſuſpected of partiality to that theory, which we feel ourſelves compelled to adopt.

* Dr R his *E the In tual P of M.*

22 The h theſi Plato

" Plato illuſtrates our manner of perceiving external objects thus: He ſuppoſes a dark ſubterraneous cave, in which men lie bound in ſuch a manner as that they can direct their eyes only to one part of the cave. Far behind there is a light, of which ſome rays come over a wall to that part of the cave which is before the eyes of our priſoners. A number of men variouſly employed paſs between them and the light, whoſe ſhadows are ſeen by the priſoners, but not their perſons themſelves. In this manner did that philoſopher conceive, that by our ſenſes we perceive not things themſelves, but only the ſhadows of things; and he ſeems to have borrowed his notions on this ſubject from the diſciples of Pythagoras.

Of A ſtotle

" If we make due allowance for Plato's allegorical genius, his ſentiments with reſpect to ſenſation and perception correſpond very well with thoſe of the Peripatetics. Ariſtotle, the founder of that ſchool, ſeems to have thought, that the ſoul conſiſts of two or three parts, or rather that we have three ſouls—the vegetable, the animal, and the rational. The animal ſoul he held to be a certain *form* of the body, which is inſeparable from it, and periſhes at death. To this ſoul the ſenſes belong: and he defines a ſenſe to be that which is capable of receiving the ſenſible forms, or ſpecies of objects, without any of the matter of them; as wax receives the form of the ſeal without any of its matter. Of this doctrine it ſeems to be a neceſſary conſequence, that bodies are conſtantly ſending forth, in all directions, as many different kinds of forms without matter as they have different ſenſible qualities. This was according-

Of Perception. ly maintained by the followers of Aristotle, though not, as far as we know, taught by himself. They disputed concerning the nature of these forms or species, whether they were real beings or nonentities: but of matter and form we shall have occasion to speak afterwards.

24 Of Des Cartes; "After Aristotle had kept possession of the schools for more than a thousand years, his authority, which had often supplied the place of argument, was called in question by Lord Bacon and others. Des Cartes, however, was the first philosopher who, convinced of the defects of the prevailing system, attempted to form another entirely new: but on the nature of perception by means of the senses he differs little or nothing from those who had preceded him in that department of science. He denies, indeed, and refutes by solid reasoning, the doctrine which maintains that *images*, *species*, or *forms* of external objects, come from the objects themselves, and enter into the mind by the avenues of the senses. But he takes it for granted, as all the old philosophers had done, that what we immediately perceive must be either in the mind itself, or in the brain, to which the mind is immediately present. The impressions made upon our organs, nerves, and brain, can be nothing, according to his philosophy, but various modifications of extension, figure, and motion. There can be nothing in the brain like *sound* or *colour*, *taste* or *smell*, *heat* or *cold*. These are sensations in the mind, which, by the laws of the union of the soul and body, are raised on occasion of certain traces in the brain; and although he sometimes gives the name of ideas to these traces, he does not think it necessary that they should be perfectly like the things which they represent, any more than that words and signs should resemble the things which they signify.

"According to this system it would appear, that we perceive not external objects *directly* by means of our senses; but that these objects, operating either mediately or immediately upon the organs of sense, and they again upon our nerves and brain, excite in the mind certain sensations; whence we *infer* the existence of external objects from our sensations of which they are the cause. Perception of external objects, therefore, according to Des Cartes, is not one simple original act of the mind, but may be resolved into a process of reasoning from effects to causes."

25 Of Malebranche; The doctrines of Malebranche, Locke, and Hartley, respecting perception, differ not essentially from that of Des Cartes. Malebranche, indeed, supposes, that external objects are not themselves the causes of perception; but that the Deity, being always present to our minds more intimately than any other being, does, upon occasion of the impressions made upon our organs of sense, discover to us, as far as he thinks proper, and according to fixed laws, his own ideas of the object: and thus, according to him, we see all things in God, or in the divine ideas. He agrees, however, with Des Cartes and the ancient philosophers, in considering it as a truth which it is impossible to question, that we perceive not the objects without us, the sun, moon, and stars, &c. because it is not likely that the soul sallies out of the body, and takes a walk, as it were, through the heavens to contemplate these objects. She sees them not therefore by themselves; and the immediate object of the mind, when it sees the sun, is not the sun itself, but something which is intimately united to the mind, and is that which he calls an *idea*.

26 Of Locke. Locke speaking of the reality of our knowledge, says: "It is evident the mind knows not things immediately, but only by the intervention of the *ideas* it has of them. Our knowledge, therefore, according to him, is real only so far as there is a conformity between our ideas and the things which they represent." The manner of our perceiving external objects he illustrates by the following similitude: "Methinks the understanding is not much unlike a closet wholly shut from light, with only some little opening left, to let in external visible resemblances or ideas of things without. Would the pictures coming into such a dark room but stay there, and lie so orderly as to be found upon occasion, it would very much resemble the understanding of a man in reference to all objects of sight, and the ideas of them *." He has elsewhere † defined an *idea* thus: "Whatsoever the mind perceives in itself, or is the immediate object of perception, thought, or understanding, that I call an *idea*; and the power to produce any idea in our mind, I call *quality* of the subject wherein the power is." He likewise thinks it "easy to draw this observation, that the ideas of what he calls primary qualities of bodies, viz. *extension*, *solidity*, *figure*, and *mobility*, &c. are resemblances of these qualities as they really exist in the body themselves."

* *Essay on the Understanding*, book ii. chap. 11.

† Book ii. chap. 8.

This unguarded expression, which affirms that ideas in the mind are the resemblances of external things, has brought upon Mr Locke much undeserved ridicule. That on this and other occasions he uses the word *idea* with too great latitude, and that he often confounds ideas with sensations, and even with the causes of sensation, must be admitted by his warmest admirers: but we believe, that by an attentive reader, who peruses his whole work, and compares such passages as are obscure with those which are clearer, his meaning may always be discovered, and with respect to sensation and perception will generally be found just. That by calling the ideas of primary qualities resemblances of the qualities themselves, he meant nothing more than that bodies in all possible states impress the senses, nerves, and brain, in such a manner as to produce in the mind certain sensations: between which and those impressions there is an inseparable, though unknown, connection, is evident from the account which he gives of the manner of perception. "Our senses (says he), conversant about particular sensible objects, do convey into the mind several distinct perceptions of things, according to those various ways in which these objects affect them: and thus we come by those ideas we have of *yellow*, *white*, *heat*, *cold*, *soft*, *hard*, *bitter*, *sweet*, and all those which we call sensible qualities; which when I say the senses convey into the mind, I mean, they from external objects convey into the mind what produces those perceptions." And as bodies can act only by impulse, he adds, that "those perceptions can be produced only by an impression made upon the senses, and some motion thence continued by our nerves to the brain or seat of perception."

27 Of Hartley. Dr Hartley was the pupil of Locke and Newton; and has, in a more satisfactory manner than all who

had

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had preceded or have fince followed him, explained the material part of the procefs of perception. His principles we fhall have occafion, during the courfe of the article, to develope pretty fully. For our prefent purpofe it is fufficient to fay, that all his obfervations and arguments evidently fuppofe, that nothing diftant from the mind can be perceived in the immediate act of fenfation; but that the apparently immediate perception of external objects is an inftance of early and deep-rooted affociation.

28
Of Hume.

In this fentiment Mr Hume agrees with his predeceffors; but he obfcures his philofophy, and mifleads his reader, by confounding fenfations with the impreffions from which they proceed. "Every one (fays he *) will allow, that there is a confiderable difference between the perceptions of the mind, when a man feels the pain of exceffive heat, or the pleafure of moderate warmth, and when he afterwards recals to his memory this fenfation or anticipates it by his imagination." The lefs forcible and lively of thefe perceptions he with great propriety calls *ideas;* but it is either through wilful perverfenefs, or confufion of intellect, that he chooses to call the others *impreffions.* Senfation and perception are caufed by *impreffions;* but they are no more impreffions themfelves, than the pain occafioned by the ftroke of a bludgeon is the ftroke itfelf, or the bludgeon with which it was ftruck. But more of this afterwards.

* *Inquiry concerning Human Underftanding*, fect. ii.

29
Agreement of philofophers, and the reafon of it.

Thus far, then, that we perceive not external objects *directly*, but infer their exiftence from certain fenfations excited in our minds by the operation of thefe objects upon our *fenfes*, *nerves*, and *brain*, feems to have been the opinion of every philofopher from Pythagoras † to Mr Hume. For an opinion fo univerfal, and at the fame time fo contrary to the perfuafion of the multitude, fome cogent reafon muft have been affigned. That reafon has been given by many philofophers, but by none with greater perfpicuity than the late Dr Porterfield in his effay concerning the motion of the eyes. "How body acts upon mind, or mind upon body (fays he), I know not; but this I am very certain of, that nothing can act, or be acted upon, where it is not: and therefore, our mind can never perceive any thing but its own proper modifications, and the various ftates of the fenforium to which it is prefent. So that it is not the external fun and moon, which are in the heavens, that our mind perceives, but only their image or reprefentation impreffed on the fenforium. How the foul of a feeing man fees thofe images, or how it receives thofe ideas from fuch agitations in the fenforium, I know not; but I am fure it can never perceive the external bodies themfelves to which it is not prefent."

† See *Mofheim's edition of Cudworth's Intellectual Syftem*, where the opinions of the philofophers of antiquity are more faithfully collected than in any other work with which we are acquainted.

30
Dr Reid differs from his predeceffors.

This reafoning appears to have force; and, perhaps, the unanimous agreement of thinking men in all ages has ftill greater force: yet the doctrine which prevailed fo long, and which to Locke appeared fo evident as to need no proof, has been lately called in queftion by fome eminent philofophers of our own country; who, though they allow that we cannot perceive external objects but by means of the fenfes, yet affirm that they are the objects themfelves which we perceive directly; and that in perception there is no affociation which can be refolved into a procefs of reafoning from fenfations the effects, to external objects the caufes. Dr Reid, who was perhaps the firft, and is unqueftionably the ableft of this clafs of philofophers, has expreffed himfelf on the fubject as follows.

31
Combats their arguments.

"If we attend to the ACT of our mind which we call the perception of an external object of fenfe, we fhall find in it thefe three things: *firft*, Some conception or notion of the object perceived. *Secondly*, A ftrong and irrefiftible conviction and belief of its prefent exiftence. And, *thirdly*, That this conviction and belief are immediate, and not the effect of reafoning ‡." To the firft and fecond of thefe propofitions, we are perfuaded that Des Cartes and Locke would readily have affented; nor do we imagine that they would have denied the third, had the author allowed that this ftrong and irrefiftible conviction is the confequence of an early and deep-rooted affociation refolvable into a procefs of reafoning. This, however, the learned profeffor does not allow; for he repeatedly affirms, that it is inftinctive and original, and that "the conftitution of our power of perception determines us to hold the exiftence of what we diftinctly perceive as a firft principle, from which other truths may be deduced, but it is deduced from none." With this view of the matter, he could with no propriety attempt to fupport his own opinion by argument; but to the reafonings of Dr Porterfield and others in defence of the Cartefian theory, he replies in the following words: "That nothing can act immediately where it is not, I think muft be admitted (D); for I agree with Sir Ifaac Newton, that power without fubftance is inconceivable. It is a confe-

‡ *Effays on the Intellectual Powers of Man*, Eff. II. c. 5

(D) One of the moft celebrated of Dr Reid's followers thinks otherwife. "That no diftant fubject can act upon the mind, is a propofition (fays Lord Kames) which undoubtedly requires evidence; for it is not inftinctively certain: And, therefore, till the propofition be demonftrated, every man may without fcruple rely upon the conviction of his fenfes, that he hears and fees things at a diftance." But his Lordfhip ought to have known, that Locke and Berkeley, the two philofophers whom he was combating, have no where called in queftion the conviction of their fenfes. They do not, indeed, admit, that the external organs are themfelves percipient, or that by means of them the mind can *immediately* perceive diftant objects; but they have no where denied, that through the *medium* of them the mind comes to the knowledge of external exiftence. And the reafons which they affign for this twofold opinion are, that in perception they experience action or the effects of action, which is not their own; and that it is an intuitive truth, that nothing can act where it is not prefent. "But admitting (fays his Lordfhip) that no being can act but where it is, is there any thing more fimple or more common, than the acting upon fubjects at a diftance by intermediate means? This holds in fact with refpect both to feeing and hearing." It certainly does, and with refpect to the other fenfes likewife; but it is the very thing for which Locke and Berkeley would have contended, had any man in their days prefumed to call it in queftion. It is the very foundation of their fyftem; and if it be granted, nothing can be more evident than that external exiftence is not the *immediate* object of perception. See *Appendix to Elements of Criticifm.*

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consequence of this, that nothing can be acted upon immediately where the agent is not present: let this, therefore, be granted. To make the reasoning conclusive, it is farther necessary, that when we perceive objects, either they act upon us, or we act upon them. This does not appear self-evident, nor have I ever met with any proof of it ‡."

‡ Essays on Intellectual Powers of Man, Essay ii. chap. 14.

Of the profundity of Dr Reid's understanding, we have the most firm conviction; nor is there any metaphysician, ancient or modern, from whom we differ with greater reluctance: but we cannot help thinking this a very rash assertion, as his own works appear to us to afford complete proof, that, in perception, the mind both acts and is acted upon. Let us attend however to the reasons which, on this occasion, induce him to think that in perception there is no action either of the object on the mind or of the mind on the object.

"When we say, that one being acts upon another, we mean, that some power or force is exerted by the agent, which produces, or has a tendency to produce, a change in the thing acted upon. If this be the meaning of the phrase, as I conceive it is, there appears no reason for asserting, that in perception, either the object acts upon the mind or the mind upon the object. An object, in being perceived, does not act at all. I perceive the walls of the room where I sit; but they are perfectly inactive, and therefore act not upon the mind. To be perceived, is what logicians call an external denomination, which implies neither action nor quality in the object perceived."

32
We think successfully, and

This last sentence we pretend not to understand. Substance without qualities is to us inconceivable, and certainly is no object of perception; for Dr Reid himself has told us, and told us truly, that "the objects of perception are the various qualities of bodies." That an object in being perceived does not act at all, is directly contrary to what the ingenious author has taught us, both in his *Inquiry* and in his *Essays*, viz. that "it is a law of our nature that we perceive not external objects, unless certain impressions be made by the object upon the organ, and by means of the organ upon the nerves and brain;" for if the external object in being perceived make impressions, it is certainly not true that it acts not at all. It is indeed readily acknowledged, that when one perceives the walls of the room where he sits, these walls do not act immediately upon the organs of sight; but it does not, therefore, follow, that they are perfectly inactive: for it is known to all mankind, that from every point of the wall which is seen, rays of light are reflected to the eye; that those rays make upon the *retina tunica* an impression, which is conveyed by the optic nerve to the brain; and that this impression on the brain is one of the immediate causes of vision In what *particular manner* it causes vision, we shall never be able to discover, till we know more of the laws which unite mind and body, and by which one of these is qualified to act upon the other; but because we know not the *manner* of this operation, to affirm that there is no operation at all, seems to be as absurd as it would be to affirm, because we perceive no necessary connection between a stroke and the sensation of sound, that the sound of a musical string is not caused by the stroke of a plectrum. That God might have given us powers of perception of a different kind from those which we possess, there can be no doubt; but with what we might have been, we have no concern. As we are, we know perfectly that the eye is an instrument of vision, because without it nothing can be seen: we know also, that the retina and optic nerves are equally necessary; because if they be disordered, vision is still wanting: we know likewise, that the brain is necessary to all perception; because, when it is disordered, thinking either entirely ceases or is proportionably disturbed. And, lastly, we are not more certain of our own existence, than that *actual perception* takes not place but when the object makes an impression upon some organ of sense: for when no rays of light fall upon the eye, we see nothing; when no sapid body is applied to the tongue and palate, we taste nothing; and if we could be removed from every thing solid, we would feel nothing. These are conclusions which cannot be controverted. They are admitted equally by the philosopher and by the plain unlettered man of common sense; nor are they rendered one whit less certain by our not being able to go a step farther, so as to discover in what *manner* the brain or the affections of it can be the immediate instrument of sensation and perception. For (as Dr Reid, in the spirit of true philosophy, observes ‡), "in the operations of mind, as well as in those of bodies, we must often be satisfied with knowing that certain things are connected and invariably follow one another, without being able to discover the chain that goes between them. It is to such connections that we give the name of *laws of nature*: and when we say that one thing produces another by a law of nature, this signifies no more, but that one thing which we call in popular language *the cause*, is constantly and invariably followed by another which we call *the effect*; and that we know not *how* they are connected."

‡ Inquiry into the Human Mind, 4th edit. p. 258.

In the preceding section we have observed, that in sensation the mind exerts some energy; and therefore, as on every hypothesis perception is a consequence of sensation, it follows, that in perception the mind cannot be wholly inactive. Dr Reid, in his Essays on the Intellectual Powers of Man, seems to affirm that it is. "I see no reason (says he) to believe, that in perception the mind acts upon the object. To perceive an object is one thing, to act upon it is another: Nor is the last at all included in the first. To say that I act upon the wall, by looking at it, is an abuse of language, and has no meaning." This is indeed true: it would be a great abuse of language to say, that by looking at the wall a man acts upon it; but we do not believe that any man ever said or supposed such a thing. The philosophers whose opinion he is combating, might argue in this manner. We are conscious that in perception the mind is active; nothing can act immediately where it is not; the mind cannot act immediately upon external existence: external existence, therefore, is not the immediate object of that energy which is exerted in perception. As Dr Reid affirms that external existence is the immediate object of perception, he must deny the first proposition in this argument; for *if it* be granted, as we have just seen that in his reply to Dr Porterfield he admits the second,

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second, the laws of reasoning will compel him to admit the third. To say that in perception the mind acts not upon *external* objects, is a truth in which all mankind are agreed; and it is the very principle from which his antagonists infer, that the conviction of the present existence of external objects is not an original and instinctive consequence of sensation, but an early and deep-rooted association which may be resolved into a process of reasoning. His meaning, therefore, must be, that in perception the mind *acts not at all*: but this is directly contrary to his definition of perception, which he calls an ACT of the mind: it is likewise contrary to his theory of perception, as it is detailed in *the Inquiry into the Human Mind on the principles of Common Sense*. We are there taught, with equal elegance and perspicuity, "that an impression made by an external object upon the organ, nerves, and brain, is followed by a *sensation*, and that this sensation is followed by the perception of the object." We are likewise taught, that "although the Peripatetics had no good reason to suppose an active and passive intellect, they yet came nearer the truth, in holding the mind to be, in sensation, partly passive and partly active, than the moderns in affirming it to be purely passive. Sensation, imagination, memory, and judgment, have by the vulgar, in all ages, been considered as acts of the mind. The manner in which they are expressed in all languages shows this: for when the mind is much employed in them, we say, it is very active; whereas, if they were impressions only, we ought to say that the mind is very passive." All this is undeniable; but if sensation necessarily precede perception, and if in sensation the mind be active, what becomes of the assertion, that in perception it acts not at all? Indeed we may appeal to the common sense of mankind, whether any thing can be perceived without some mental energy of the percipient. For when the impressions made on the external senses are faint, in order to be conscious of them an evident exertion is requisite, not of the organ only, but also of the mind, as in perceiving very remote objects and sounds; but when the impressions are stronger, the perception is involuntary and unavoidable, as has been already explained in the preceding section.

33
Therefore the old theory of perception to be preferred to his.

It being thus certain that in perception the mind both acts and is acted upon, and it being universally acknowledged that nothing can act where it is not, we feel ourselves compelled to admit with the Cartesians, that in perception the conviction of the present existence of external objects is not original and instinctive, but the consequence of an early and unavoidable association of certain sensations with the causes which produce them. In this opinion we are still more confirmed by the well-known fact, that particular pressures upon the organ, nerves, and brain, excite not only sensations, but even perceptions of objects apparently external, when no such objects are within the reach of our senses. Thus §, if a man in the dark press either corner of his eye with his finger, he will see a circle of colours like those in the feather of a peacock's tail, though no such external object be before him, and though the room be so dark that nothing external could possibly be seen. Again, if a burning coal be nimbly moved round in a circle, with gyrations continually repeated, the whole circumference of the circle will at once appear on fire, though it is certain that there can be really on fire but one portion of that circumference, equal in length to the diameter of the coal. These are facts known to all mankind; and they are perfectly irreconcileable with the supposition, that the perception of external objects by the sense of sight is original and instinctive; but they are at once accounted for, if it be true that rays of light falling from external objects upon the *retina* tunica agitate the optic nerves and brain, and that such agitations excite sensations in the mind which experience has taught us to refer to external objects, as, under God, their ultimate cause.

§ Hartley's Observations on Man.

But though we have declared ourselves to be in this instance Cartesians, we do not admit all the absurdities which have sometimes been imputed to that system of perception. We do not believe that external objects are perceived by means of images of them in the mind or the brain; nor do we think that Des Cartes or Locke has any where affirmed that they are, otherwise than by an expression obviously figurative, denoting, not that the actual shapes of things are delineated in the brain or upon the mind, but only that impressions of some kind or other are conveyed to the brain by means of the organs of sense and their corresponding nerves; and that between those impressions and the sensations excited in the mind, there is a real, and in our present state a necessary, though unknown, connection.

34
That theory fairly stated, &c.

Upon the whole, we think that there is good evidence for believing, that in perception the process of nature is as follows: *First*, If the object be not in contact with the organ of sense, there must be some medium which passes between them; as, in vision, the rays of light; in hearing, the vibrations of elastic air; and in smelling, the effluvia of the body smelled; otherwise we have neither sensation nor perception. *Secondly*, There must be some action or impression upon the organ of sense, either by the immediate application of the object, as in the two senses of touch and taste; or by the medium that goes between them, as in the other three senses. *Thirdly*, The nerves which go from the brain to the organ, must receive some impression by means of that which was made upon the organ; and by means of these nerves that impression must be carried to the brain. *Fourthly*, The impression made upon the organ, nerves, and brain, rouses the dormant energy of the mind; and this double action of the mind and the object produces a sensation. And, *lastly*, As we know by experience that the mind alone cannot by any exertion of its own produce one sensation, and are intuitively certain that nothing can begin to exist without a cause, we infer from the existence of any new sensation the existence of some other cause than the internal energy of the mind, from which that sensation proceeds; and this cause experience teaches us to be the external object. This process is carried on so rapidly, and the several parts of it, by being continually repeated, are so closely associated, that except by a reflex act of the mind we distinguish them not from one another, and therefore we denominate the whole *perception*.

35
Shows the difference between this and Dr Reid's.

It is with extreme diffidence that we advance a doctrine which Dr Reid has controverted; but he differs from us only in the last stage § of the process, where he supposes sensation and perception to be two simple and independent acts of the mind. Yet he sometimes expresses

§ See *Inquiry into the Human Mind*, 4 edit. p. 3..

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expresses himself, as if he thought as we do, that in perception the belief of the present existence of external objects is rather the result of experience than an instinctive persuasion. Thus, speaking of the perception which we have in smelling a rose, he says §, "Perception has always an external object, and the object of my perception in this case is that quality in the rose which I discern by the sense of smell. Observing that the agreeable sensation is raised when the rose is near, and ceases when it is removed, I am led by my nature [we think *by experience* would have been more proper] to conclude some quality to be in the rose, which is the cause of this sensation. This quality in the rose is the object perceived; and that act of my mind, by which I have the conviction and belief of this quality, is what in this case I call perception." Again (he says) that "three of our senses, viz. smell, taste, and hearing, originally give us only certain sensations, and a conviction that these sensations are occasioned by some external object. We give a name to that quality of the object by which it is fitted to produce such a sensation, and connect that quality with the object and with its other qualities. Thus we learn, that a certain sensation of smell is produced by a rose; and that quality in the rose by which it is fitted to produce this sensation we call the *smell of the rose*. Here it is evident that the sensation is original. The perception that the rose has that quality which we call its *smell*, is acquired."

§ Essays on Intellectual Powers of Man, Essay ii. chap. 15. p. 241.

To this doctrine no Cartesian could possibly object; for it is the very account which Des Cartes himself would have given of perception by the organ of smell, as it resolves such a perception into an early association between a certain sensation and that external quality from which we know by experience that the sensation proceeds. Indeed the excellent author repeatedly affirms, that every different perception is conjoined with a sensation which is proper to it; and that the one is the sign, and the other the thing signified. He likewise doubts *, whether children, from the time that they begin to use their senses, make a distinction between things which are only conceived or imagined, and things which really exist. But if the conviction of the present existence of external objects were in perception *instinctive*, we cannot see how there could be room for such a doubt: for the mere senses of children are as perfect as those of full grown men; and they know well the difference between actually sucking their nurses and only thinking of that operation, though they be not capable of expressing that difference in language.

* Essays on Intellectual Powers of Man.

36 The theory offered to prove the existence of something external.

But if in perception our conviction of the present existence of external objects be not instinctive, what, it may be asked, is the evidence that such objects really exist? This question we shall partly answer in the following section, and more completely when we come to examine Berkeley's theory of the non-existence of matter: but from what has been said already, it is sufficiently evident, that every sensation compels us to believe in the present existence of something different from ourselves, as well as from our sensations.

Sect. III. *Of the Objects of each Sense respectively.*

37 Touch, the sense by which we perceive heat and cold, &c.

Hitherto we have considered sensation and perception in general, and shown that it is not by instinct that we perceive the existence of external objects. This will appear more clearly, if we can ascertain the precise nature of that information which each sense affords us: and in order to this, we shall begin with the sense of *touch*, not only because it is that which is certainly first exercised, but also because there is a meaning in which all the others may be resolved into it.

38 The nature of heat and cold, which are perceived immediately.

By means of touch we perceive many things; of which the chief are, heat and cold, hardness and softness, roughness and smoothness, extension, figure, solidity, and motion. Of these perceptions, some are immediate; and others, as we are persuaded, early associations, which may be resolved into a process of reasoning. The perceptions of heat and cold are immediate. When a person for the first time in his life approaches the fire, he feels heat; and when he is first exposed to the frost, he feels cold. What are heat and cold, and where do they reside? They are obviously the reverse of each other; but are they external objects, or mere sensations in the mind? They are undoubtedly sensations which have no existence but when they are felt. To every man not altogether a stranger to these speculations, this proposition is self-evident; but to the bulk of the people it appears an extravagant paradox. To make it plain, however, to the meanest capacity, it is sufficient to observe, that at a certain distance the fire has no perceptible influence upon any person; if that distance be lessened, we feel an agreeable warmth; approach a little nearer, and the warmth becomes disagreeable; and still nearer, it will rise to pain. No man supposes the pain inflicted by a sword to exist in the sword, or any where else but in a sentient being: It is equally absurd to suppose pain to exist in fire, or any where else but in a sentient being. But that which at one distance is pain, at another is only agreeable warmth; and since warmth and pain are only different degrees of the same feeling, it is equally absurd to suppose the one as the other in the fire. What then is the object of sense when we feel heat? There is obviously no object beyond the present sensation.

39 Their external causes.

But has the sensation of heat no cause independent of us? Undoubtedly it has, and experience teaches us that the cause is in the fire. We know that we cannot produce the sensation of heat in ourselves by any mental energy of our own; and we are intuitively certain, that nothing can begin to exist without some cause. A man on the top of a mountain covered with snow, may imagine or remember what he felt when in the neighbourhood of fire, and thus have in his mind what is called an *idea* of heat; but that idea will not warm him (E) like the actual sensation, which no exertion of his own can in such circumstances produce.

3 Q 2 When

(E) ——Who can hold a fire in his hand,
By thinking on the frosty Caucasus?
Or cloy the hungry edge of appetite,
By bare imagination of a feast?
Or wallow naked in December's snow,
By thinking on fantastic summer's heat?
Oh no! the apprehension of the good
Gives but the greater feeling to the worse.
K. Richard II.

Objects of the reſpective Senſes.

When he leaves the mountain, however, and approaches the fire, he feels the ſenſation actually produced, and produced as often as he makes the experiment. He is, therefore, under the neceſſity of inferring, that in the fire there is ſome power or quality which, acting either mediately or immediately upon his ſenſe of touch, excites the feeling which is called *heat*. What that power is, we ſhall perhaps never be able to diſcover; but it is ſelf-evident, that it is neither heat nor the reſemblance of heat, though in vulgar language it is known by that name.

The ſame reaſoning holds good with reſpect to cold. There is at certain times, and in certain countries, ſome power in the air which congeals water and cauſes cold; but that power is as different from the ſenſation of cold, as the power of fire is different from the ſenſation of heat, or the point of a ſword from a fleſh wound.

40 The perceptions of extenſion and figure, &c. not immediate.

By the ſenſe of touch we perceive extenſion, figure, and ſolidity, &c. but we do not perceive them *immediately* as we perceive heat and cold; for extenſion, figure, and ſolidity, are not ſenſations. Thoſe perceptions then muſt be acquired; and more clearly to aſcertain the manner in which we acquire them, let us ſuppoſe a man from his birth deſtitute of the ſenſe of ſight and the power of local motion, but poſſeſſed of intellect and every other faculty which we enjoy.—Such a perſon, it is obvious, would be capable of every ſenſation and perception which is *original* to us, except the perception of colours; but we doubt whether it would be poſſible to give him perceptions of extenſion, figure, and ſolidity. Let us try: and as he cannot move a ſingle limb or member of himſelf, let us ſuppoſe a ſolid ſubſtance of ſmall dimenſions to be gently preſſed againſt any part of his body; what would ſuch preſſure communicate to him? We think it could communicate nothing but a new ſenſation, to which, as it is neither pleaſing nor painful, no name has hitherto been given, except the general one of *feeling*. This ſenſation he would not know whether to refer to an external or internal cauſe; or rather he could have no notion whatever of an external cauſe, though he would at the ſame time be conſcious that the new ſenſation was not excited by any energy of his own will. Were the preſſure to be gradually increaſed till it roſe to pain, our blind man would ſtill be conſcious of nothing but a ſenſation, which could not lead him to the notion of extenſion, figure, or ſolidity, becauſe mere ſenſations cannot be conceived as either ſolid or extended. Let us next ſuppoſe the preſſure to be applied ſucceſſively to different parts of his body; he would now indeed be conſcious of ſucceſſive ſenſations, but he could not aſſign to them either extenſion or *place*: for it has been already ſhown that the external parts of the body are not themſelves ſentient; and it ſhall be ſhown afterwards, that to a man who has never perceived motion, place is abſolutely inconceivable. Laſtly, let us ſuppoſe the dimenſions of the preſſing ſubſtance to be greatly enlarged: what would then follow? nothing, we apprehend, but an increaſe of pain: for though his whole body were preſſed *ab extra*, the preſſure could affect the individual being which is ſentient, not more extenſively, but only more violently. It appears, therefore, that a man blind from his birth, and deſtitute of the power of local motion, could never be made to perceive extenſion, figure, or ſolidity.

Objects of the reſpective Senſes.

41 How they are acquired.

Let us now ſuppoſe this man to receive by a miracle the uſe of his limbs, and to be ſuddenly prompted, by ſome inſtinctive impulſe, to ariſe and walk. So long as he met with no obſtacle in his way, he would not, we apprehend, acquire by this exerciſe any correct notions of extenſion or figure; but were a ſtone or log of wood of conſiderable dimenſions to be laid acroſs his uſual walk, the caſe would ſoon be altered. He would feel himſelf interrupted in his courſe, and he would at the ſame inſtant recognize his wonted ſenſations of touch. After being twice or thrice thus interrupted, he would learn from experience that the interruption or reſiſtance proceeded from the ſame cauſe which in this inſtance communicated to him the ſenſation of feeling; and were he to run his hand along the ſurface of the log or ſtone, he would perceive the reſiſtance and the ſenſation continued. As every effect muſt have an adequate cauſe, this continued reſiſtance would compel him to believe the continuity of ſomething external in every direction in which he felt his hand reſiſted; but ſuch continuity of being is all that is meant by the word extenſion. At the very ſame time, and by the very ſame means, he would gradually acquire the perception of figure; for by running his hand in every direction over the ſurface of the obſtacle which oppoſed him, he would ſoon perceive it on all ſides limited; but the limits of extenſion is a phraſe of preciſely the ſame import with figure. It appears, therefore, that without the power of local motion, men could never by the ſenſe of touch acquire the notions of extenſion and figure; and the ſame will be found to be the caſe with reſpect to hardneſs and ſoftneſs.

42 Hardneſs and ſoftneſs, how perceived.

When we preſs our hand gently againſt a ſtock or a ſtone, we feel a ſenſation which is neither painful nor pleaſing. When we preſs it more violently, the ſenſation becomes painful, and we experience in the object a reſiſtance which we have not power to overcome. When we preſs butter or pomatum very gently, we have a ſenſation in all reſpects ſimilar to that which we felt when we gently touched the ſtock or the ſtone. But when we preſs the butter with violence, we feel no pain, and experience little reſiſtance; for the parts of which it is compoſed give way before the hand, though the parts of the ſtock or the ſtone remained fixed and immoveable. That the parts of one body ſhould thus reſiſt a preſſure to which the parts of another ſo readily yield, muſt proceed from ſome difference in the texture of the two bodies: for by the ſenſe of touch we perceive the effects to be different; and are therefore certain that they muſt proceed either from different cauſes, or from the ſame cauſe operating with different degrees of force. That particular texture which makes the parts of a ſtone reſiſt the preſſure of touch, we call hardneſs; and the texture which makes the parts of butter or pomatum give way to touch, we call ſoftneſs. But what hardneſs and ſoftneſs are in themſelves, touch cannot inform us; for they are neither ſenſations, nor ſimilar to ſenſations. We acquire, however, by experience, ſo complete notions of hardneſs and ſoftneſs, that every one who underſtands the Engliſh language perfectly knows the meaning of theſe words as ſoon as he hears them; and when he is told that

Objects of the respective Senses. that one body is hard and another soft, he knows with absolute certainty that the meaning of the assertion is, that the parts of the body which is said to be hard are held together by some unknown cause operating forcibly, and that the parts of the other are held together by the same or a similar cause operating with less force.

43 Roughness and smoothness. We acquire the notions of roughness and smoothness in the very same way and by the very same means that we acquire ideas of extension and figure. To describe the process at large would certainly be superfluous; for if what we have said concerning our perceptions of extension and figure be just and intelligible, every one will, without farther assistance, discover for himself how he perceives roughness and smoothness. *Motion* shall be considered among the adjuncts of body; but in order to understand what body itself is, it will be necessary, before we dismiss the sense of touch, to inquire how we come by the notion of solidity.

44 Solidity, and how perceived. Solidity is one of those notions, or, in the language of Locke, one of those ideas, which are commonly said to be acquired by the sense of touch. That touch gives the first hint towards our notion of solidity, is certainly true; but that hint must be afterwards improved by the intellect, or we never could have an adequate knowledge of what is meant when any thing is said to be absolutely solid. We know by experience, that we can at pleasure open and shut our empty hand without meeting with any resistance. We know likewise, that when we grasp an ivory ball of three or four inches diameter, no force which we can exert will bring together the several parts of the hand, which were easily brought together when we grasped nothing. In this way do we acquire our first notion of solidity; for that word denotes nothing more in this instance than the power or property of the ball, by which our fingers are excluded from the place which it occupies. Solidity differs from hardness in this respect, that hardness results from the strong cohesion of the parts of a hard body, which renders it difficult to change the places of those parts, as they respect one another; whereas solidity respects the whole mass, and is as essential a quality of water as of adamant. A drop of water, indeed, placed between two plane surfaces of marble, will not like adamant preclude their contact; because the parts of a drop of water, cohering but loosely to one another, give way to the pressure, and escape in every lateral direction. But if a drop of water be confined on all sides, as in a globe of gold, we know from experiment that no force will bring the sides of the globe together without forcing the water through the pores of the metal; and hence we infer solidity to be essential to every corporeal substance.

Thus then it appears, that of the objects perceived by touch not one is *immediately* perceived except heat, cold, and other sensations. The sensations, as they are not excited by any internal energy of our own, lead us indeed to something external as their cause; and by comparing the different sensations with each other, and observing what effects their external causes have upon our own motions, we are naturally led to conceive these causes as extended, figured, solid, hard or soft, rough or smooth, &c.; but it is obvious that this conception is the result of experience, and a process of mental reasoning

On the senses of taste, smell, and hearing, it is needless to say much. The immediate objects of these are confessedly sensations which have no existence but when they are perceived; though experience teaches us to refer them all to external objects as their respective causes. With respect to smell, this has been made sufficiently evident in the preceding section, and it is not less evident with respect to taste and hearing. Objects of the respective Senses. 45 Nothing but mere sensations the objects of smell,

46 Taste, and Certain bodies applied to the tongue and palate, and moistened with the saliva, excite certain sensations which we call tastes. These sensations, however, are not in the bodies; nor can they have any existence but in a sentient being. They are produced in consequence of impulses on the nerves of the tongue and palate, exciting certain agitations in the brain; but the sensation itself is neither impulse nor agitation. Some substances excite tastes which are agreeable, and others such as are disagreeable; and there are not a few which excite no taste at all. Bodies, which applied to the tongue and palate of one man produce tastes that are agreeable, applied to the same organs of another man give him tastes which are disagreeable; and we have all experienced, that the same substance, which, when the organs are sound, excites a sweet or pleasant taste, has, when the organs were disordered, excited a taste which was bitter or unpleasant. These facts, which cannot be controverted, afford the fullest evidence, if evidence were wanted, that taste, as we feel it, is no quality of bodies, nor has any existence out of the mind.

The organ of hearing is the *ear*, and its object is sound. It is well known, that sound is produced by certain vibrations of the air striking the tympanum of the ear, and that those vibrations are caused by the sonorous body. Sound, however, is not vibration, nor the idea of sound the idea of vibration. Sound considered by itself is a mere sensation, which can have no existence but in a sentient being. We know by experience, that it is caused by something external; but we know likewise that the effect has no resemblance to the cause. Previous to experience we could not refer sound to any external cause; far less could we discern whether it proceeded from an object above us or below us, on our right hand or on our left. It appears to us self-evident, that if a man born deaf were suddenly made to hear, he would consider his first sensation of sound as originating wholly within himself. Between that sensation and the sensations of touch, taste, smell, and sight, there is no resemblance; nor are there any relations among them, which, previous to experience, could induce him to trace them all to external objects as their several causes. Our deaf man might have learned to refer all his other sensations to their true causes, in some such way as we have described under the sense of touch; but sound would be something so new to him, and so totally different from touch, taste, and smell, that he could attribute it to nothing external. 47 Hearing.

48 It is by experience that we distinguish different sonorous bodies by their respective sounds. Experience, however, would soon teach him, that the ear is its organ, and the sonorous body its cause; and he would in time learn to distinguish one sound, that of a trumpet for instance, from another, suppose the sound of a bell; and to attribute each to its proper cause, even when neither the trumpet nor the bell was perceived by his other senses. With respect to sounds

Objects of the respective Senses.

sounds which we have been accustomed to hear, this is done so instantaneously, that some philosophers have imagined it to be the effect of an instinctive principle in our nature, totally different from experience, and independent of reason. But the fact is not so. Long before we are capable of making sensation and perception objects of reflection, we have heard the sound produced by the ringing of a bell, and seen the object which produced the sound so often, that, when we hear a similar sound again, we instantly refer it to a *bell*, though we see not the bell from which it proceeds: but this is the effect of habit, and not of instinct. Had we never perceived a bell while ringing by either of our senses of sight or touch, we could not by the sense of hearing acquire any notion of the figure or texture of the body from which the cause of the sound proceeds, tho' we had heard that sound every day of our lives. It is, indeed, by experience only that we learn to distinguish by the ear whether a sonorous body be before or behind us, on our right hand or on our left; for we find it always difficult to say from what precise quarter a strange sound proceeds; and this difficulty would be heightened to impossibility, had not all sounds something in common. Dr Sparman relates, that when he first heard the roaring of a lion, he did not know on what side of him to appprehend danger, as the sound seemed to proceed from the ground, and to inclose a circle of which he and his companions stood in the centre. The same thing has happened to every man, when the sound was such as he had never heard before; even though it was neither so loud nor so terrific as the roaring of a lion in a desert wilderness: but with respect to sounds which we are daily hearing on each side of us, we soon learn to distinguish with tolerable accuracy whether they be before or behind us, above or below, on our right hand or on our left. All this, however, is the effect, not of instinct, but of experience improved into habit.

49
Sight originally perceives nothing but colours, which are mere sensations.

Sight is justly considered as the noblest and most comprehensive of all our senses. The reason is obvious: for when a full-grown man opens his eyes, he perceives houses, trees, rivers, the earth, sun, and moon, &c. and to each of these objects belong figure, extension, colour, &c. which are all perceived instantly by means of this sense. Yet it is certain, that the sense of sight does not originally communicate to us so many perceptions; and there is abundant evidence, that an infant cannot at first, or for some weeks after its birth, distinguish by vision one object from another. *Colour* is the proper object of sight, and for some time its only object; but colour as perceived by us is a mere sensation, which can have no existence but in a sentient being. If this proposition stood in need of proof, we might observe that there are men, and even whole families, who possess the sense of sight in a degree of perfection sufficient for all the purposes of life, and yet cannot distinguish certain colours from each other; blue, for instance, from green, or perhaps from red: and there is no man who can distinguish between some particular shades of blue and green by the feeble light of a candle. Were colours the real qualities of body, this mistake of one for another could never be experienced. No man who possesses the sense of touch ever confounded hardness with softness, a sphere with a cube, or an ell with an inch. The reason is, that hardness and softness, figure and extension, are the qualities of things external; whereas colour being a mere sensation, is nothing but an affection or modification of the sentient being. But it is obvious, that sentient beings, according as they differ from one another, may be differently affected by the same external cause; so that one man may perceive that to be green which all other men perceive to be blue. The immediate external cause of the sensation of colour, is the rays of light reflected from the body, which in common language is said to be coloured. These rays falling upon the pupil of the eye, are refracted differently, according as their incidence is more or less oblique into points on the retina, where they form a picture of the external object; and from the picture, by means of the optic nerve, is communicated to the brain some impulse or agitation, which produces vision or the perception of colour. As rays of light are corporeal substances, it is obvious that they can act upon body only by impulse; but between impulse and the various sensations of *red*, *green*, *blue*, &c. there is no resemblance. For the laws of reflection and refraction, and for the structure of the eye, see OPTICS and ANATOMY. That which we have to inquire into at present is, how we learn, by means of the sense of sight, to perceive the figure, magnitude, motion, and distance of external objects, or indeed to distinguish one object from another.

A ray of light proceding, as all rays do, in a straight line, must, however great its length, affect the eye, retina, and optic nerve, as if it were a single point. From this obvious and undeniable fact, Bishop Berkeley predicted *, that a man born blind, who should be suddenly made to see, would at first perceive nothing without him, would distinguish neither the distance, size, figure, nor situation, of external objects; that he would only see in his eyes themselves, or, to speak more properly, would only experience new modifications in his mind, until joining *touch* to *sight*, he formed thus a communication with the external world, and learned, by the simultaneous exercise of the two senses, that natural language in which the *visible* is the sign of the *tangible*. This truth, which was discovered by the Bishop merely by contemplating in his own mind the nature of sensation, and the known laws of optics, after having been laughed at for more than 20 years as one of the many dreams of a visionary genius, was completely confirmed by the case of the famous patient whom Cheselden cured of a cataract; and that too, though the cataract does not produce total blindness: which makes it evident, that the first visual perceptions of the patient after his recovery could not be wholly new and unmixed. It may indeed be confirmed at any time by a simple experiment made upon an infant. For several weeks after birth, a child shuts not its eyes upon the sudden approach of an object to them, nor shows the least symptom of distinguishing one distance from another; and it is easy by a little attention to observe, how it gradually learns to distinguish objects at greater and greater distances. Indeed colour, or the immediate object of sight, being a mere sensation or affection of the mind, can have no natural relation whatever to any thing external.

* *Essay towards a new Theory of Vision.*

It is plain, therefore, that distance is in its own nature

ture imperceptible to the eye, and yet it is often perceived by ſight. How is this done? We think, in the following manner. Diſtance is one mode of extenſion, which, we have already ſeen, is perceived by means of touch. Of ſhort diſtances, our firſt ideas are doubtleſs acquired by the ſtretching out and drawing back of our arms; and thoſe ideas are ſoon ſo connected with certain ſenſations which we have in actual viſion, that the latter inſtantly ſuggeſts the former. Thus, it is a fact known by experience, that when we look at a near object with both eyes, according as it approaches or recedes from us, we alter the diſpoſition of our eyes, by leſſening or widening the interval between the pupils This diſpoſition, or turn of the eyes, is attended with a ſenſation of which every man is conſcious at the time of viſion; and this ſenſation ſeems to us to be that which in this caſe ſuggeſts the idea of greater or leſs diſtance to the mind. Not that there is any natural or *neceſſary* connection between the ſenſation of which we are conſcious, and greater or leſs diſtance; for the ſenſation is wholly internal, and the diſtance is external: But becauſe the mind has, by conſtant *experience*, found the different ſenſations occaſioned by different diſpoſitions of the eyes to correſpond to different degrees of diſtance in the object, there has grown an habitual or cuſtomary connection between thoſe ſenſations and the notions of greater or leſs diſtance. So that the mind no ſooner perceives the ſenſation ariſing from the different turn it gives the eyes in order to bring the *pupils* nearer or farther aſunder, than it is inſtantly impreſſed with a certain notion of the diſtance which was wont to be connected with that ſenſation. Again, an object placed at a certain diſtance from the eye, to which the breadth of the pupil bears a ſenſible proportion, being made to approach nearer, is ſeen more confuſedly; and the nearer it is brought, the confuſion is always the greater. The reaſon of all this is known to every optician: but it being conſtantly experienced by thoſe who never dipt into optics, there ariſes in the mind of every man an habitual connection between the ſeveral degrees of confuſion and diſtance; the greater confuſion ſtill implying the leſs diſtance, and the leſs confuſion the greater diſtance. It is of no avail to ſay, that between confuſed viſion and diſtance, great or ſmall, there is no neceſſary connection: for there is as little connection between a bluſh in the face and the mental feeling of ſhame; and yet no ſooner does a man of obſervation perceive that particular colour in the face of another, than it ſuggeſts to him the notion of that feeling or paſſion with which he has conſtantly obſerved it accompanied.

In theſe ways, however, we perceive only ſmall diſtances. Of diſtances more remote our judgment is formed from other data; and happily theſe data are not far to ſeek. It is a fact known to every man who is not totally ignorant of the ſcience of optics, that a greater number of rays fall upon the eye when reflected from a body near at hand, than can fall from the ſame body at a diſtance; and as thoſe rays operate by impulſe, it is ſelf-evident that the impreſſion muſt be ſtronger, and of courſe the ſenſation or colour more vivid, when the body is near than when it is diſtant. Now having acquired the notion of the true diſtance of objects by motion and the ſenſe of touch, and finding by uniform experience, that as they are near or far off, the ſenſation or colour which they excite in the mind through the organ of viſion is more or leſs vivid, thoſe degrees of ſenſation come to be ſo cloſely aſſociated with the reſpective diſtances of the object, that the one inſtantly ſuggeſts the other.

51 It is juſt ſo that we perceive figure by ſight. Having experienced by the ſenſe of touch that one ſurface is a ſquare and another a circle, that one body is a cube and another a ſphere; and finding our ſenſe of ſight differently affected by the ſquare and the circle, by the cube and the ſphere; theſe different affections come to be ſo cloſely connected in our minds with the figures of the reſpective bodies, that long before we are capable of reaſoning on the ſubject the one is never preſent to us without ſuggeſting the other. Nay, ſo complete in this caſe is the connection or aſſociation, that we cannot even in idea abſtract the colour from the figure; though it is certain that colour is a mere ſenſation, and figure an external quality; that colour alone is immediately perceivable by the eye, and the notion of figure ſuggeſted by the colour. We are aware that it has been affirmed, and affirmed with great vehemence, that figures of two dimenſions are immediately perceived by the eye, and perceived with greater accuracy than by the ſenſe of touch. But they who inſiſt upon this doctrine affirm likewiſe, contrary to experience and the cleareſt reaſoning, that the immediate objects of ſight are external, and that colour is a quality of bodies. In the arguments too by which they ſupport their hypotheſis, they ſeem to confound ſight as an affection of the mind, with the picture on the bottom of the eye, as if the retina were the ſentient being; whereas the retina and picture are no more than inſtruments of ſenſation. It is indeed a fact, that the picture has the ſame figure nearly with the plane of the object which is preſented to the eye; as when the object is a ſphere, the picture is a circle variouſly ſhaded in colour. It is likewiſe a fact, that the picture is enlarged in proportion as the object is brought near, and diminiſhed as it is carried to a diſtance. But theſe facts are known only to perſons ſkilled in optics; and therefore it is evident, that though calculations may be raiſed from them by mathematicians to determine the diſtance and figure of external objects, they cannot poſſibly be the data from which diſtance and figure are inferred by the vulgar, who know not that ſuch pictures on the retina exiſt. Beſides all this, it is univerſally known, that a painter, by laying on his colours properly, can make a plain ſquare ſurface appear to the eye in certain poſitions as an oblong or as a cube, and a plain circular ſurface as a concave or a convex hemiſphere. But not one of theſe things could poſſibly be done, were figure, or indeed any thing elſe than colour, the immediate object of viſion.

52 As we ſee diſtance and figure, ſo we ſee magnitude; and we ſee both in the ſame way that we ſee ſhame or anger in the looks of a man. The impreſſion made upon the bottom of the eye by rays reflected from a large magnitude, muſt neceſſarily be different from the impreſſion made by rays reflected from a magnitude that is leſs. This is ſelf-evident: and ſince the impreſſion *ab extra* is in ſome way or other the cauſe of that ſenſation, which is all of which we are originally conſcious in viſion, it is obvious that the ſenſation,

Objects of the ſeveral external Senſes.

50 Perception of diſtance by ſight, how acquired.

Objects of the reſpective ſenſes.

How figure is perceived by ſight.

Magnitude.

Objects of the reſpective Senſes.

like every other effect, muſt correſpond to the cauſe from which it proceeds. Being therefore conſcious of different ſenſations; and having, at an earlier period than we diſtinctly remember, learned by experience to refer them to different magnitudes; no ſooner is each ſenſation excited than it ſuggeſts the notion, or if you pleaſe the perception, of that magnitude with which it is connected. So completely is this aſſociation fixed in the mind, that when we look at a known object, its real magnitude appears to be as inſtantly obſerved as its colour, whilſt we hardly attend at all to the particularity of the ſenſation by which the magnitude is ſuggeſted. It is indeed cuſtomary with writers on optics to diſtinguiſh between tangible and viſible magnitude, as if any kind of magnitude were the immediate object of viſion: but this is not ſo; for magnitude is ſomething external, whereas the immediate object of viſion is a mere ſenſation. What has introduced into ſcience this mode of ſpeaking is the following fact, that as we approach a diſtant object it appears to the eye larger and larger every ſtep, and leſs and leſs as we recede from it; whereas the tangible magnitude of an object is always the ſame. The reaſon of this apparent change of magnitude to the eye, according to the diſtance at which any particular object is viewed, is, that from a near object rays of light fall in greater numbers and more diverging than from the ſame object viewed at a diſtance. This of courſe alters the nature of the viſible ſenſation: each common ſenſation is in the mind cloſely linked with a particular notion of magnitude; and by the exerciſe of ſight and touch we have learned from experience, that the particular ſenſation cauſed by diverging rays muſt be referred to a larger magnitude than that which is cauſed by parallel rays proceeding from the ſame diſtance.

53
Viſible ſenſations a kind of natural language.

Upon the whole, then, we think ourſelves intitled to conclude, that the proper and original objects of viſion conſtitute an univerſal language of the Author of Nature, by which we are inſtructed how to regulate our actions, in order to attain thoſe things that are neceſſary to the preſervation and well-being of our bodies, as alſo to avoid whatever may be hurtful or deſtructive to them. It is principally by the information of this language that we are guided in all the tranſactions and concerns of life: And the manner in which it ſignifies and marks to us the objects which are at a diſtance, is ſimilar to that of languages and ſigns of human appointment, which do not ſuggeſt the things ſignified by any likeneſs or identity of nature, but only by an habitual connection, which experience has made us to obſerve, between them. This language of the eye, like the language of the tongue, ſuggeſts by one ſenſation what may be reſolved into a variety of perceptions. A tree is compoſed of a trunk, branches, leaves; it has colour, figure, ſize; and all theſe things are at once ſuggeſted to the mind by the two words *ſpreading oak*. Juſt ſo it is with reſpect to viſion: the ſenſation received by the eye ſuggeſts at once the *trunk*, *branches*, *leaves*, *colour*, *figure*, and *ſize* of the oak, and ſuggeſts them all as the qualities of one object.

Chap. II *Of* Retention *and* Ideas.

Retention and Ideas.

From the experiment with the burning coal mentioned in n° 33, it is apparent, that ſenſations excited through the eye, together with their correſponding perceptions, remain in the mind for a ſhort time after the external exciting cauſe is removed. The ſame thing appears from another experiment which was firſt made by Sir Iſaac Newton, and which every man may repeat for his own ſatisfaction. It is univerſally known, that a proper mixture of the ſeven original colours, *red*, *yellow*, *green*, *blue*, &c. conſtitutes that uniform appearance which we call *white*. But when theſe colours are made to paſs in a rapid conſecution before the eye, they excite the very ſame perception as when they are properly mixed: which is a ſatisfactory proof that the impreſſion made by each ſeparate colour remains in the brain until a revolution of all the colours be completed; for nothing but the impreſſion of all the colours at *once* can produce the ſenſation and perception of *white*. Indeed no perſon capable of paying the proper attention to theſe things, can keep his eye fixed upon a luminous object, and afterwards ſhut it, without experiencing that the ſenſation and perception remain for ſome time after the external object is ſhut out, and that they go off gradually till they leave behind them the mental appearance, which is properly called an *idea* of the object.

54
Senſation and perception remain for very little time after the removal of the object. *Hartley on Man*

The ſame continuance of the ſenſation after the removal of its cauſe is equally obſervable in the ſenſe of hearing: for every ſound which we hear is reflected by the neighbouring bodies; and therefore conſiſts in reality of a variety of ſounds ſucceeding each other at different diſtances of time, according to the diſtances of the ſeveral reflecting bodies. Yet this cauſes no confuſion or apparent complexity of ſound, unleſs when the diſtance of the reflecting bodies is very conſiderable, as in ſpacious buildings.

With reſpect to the continuance of the ſenſation of touch, doubts have been ſtarted; but for theſe there is as little room as for doubting the continuance of the ſenſations of ſeeing and hearing. The continuance of heat after the heating body is removed, and of the ſmart of a wound after the inſtant of infliction, are proofs that every ſenſation of touch does not vaniſh with its cauſe. A man unuſed to the motion of a ſhip or a coach, after having been a day at ſea or on the road, feels or imagines he feels the rolling of the ſhip or the jolting of the coach after he is in bed and actually at reſt. Of theſe facts we know not what other account can be given, than that the agitation in the brain, which is the immediate cauſe of the ſenſation of touch, remains for ſome time after the external cauſe of the agitation is removed.

As to the ſenſes of taſte and ſmell, Dr Hartley ſeems to think that there is no clear and direct evidence for the continuance of their ſenſations after their proper objects are removed: but in this inſtance the ingenious author does not juſtice to his own theory. Let any man eat onions, garlic, or any other thing of a very pungent taſte, and immediately waſh his mouth with freſh water, ſo as that he may be ſure no part of the ſapid body remains on his tongue or palate. According to this doctrine, the taſte of the onion or garlic ſhould inſtantly vaniſh with its object; but the fact is otherwiſe. Whoever ſhall make the experiment, will find the ſenſation to remain a conſiderable time; not indeed in its original force, but weakened no more than what it muſt neceſſarily be by the introduction of

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of a new sensation excited by the water. It is more difficult to ascertain the permanency of smell: but analogy inclines us to believe, that in this particular it resembles the other senses, though we know not how to direct the reader to an experiment which will give him absolute conviction.

55 Hence we have that power or faculty called *memory*.

Whether the cause of these continued sensations, after the removal of their objects, be in the brain alone, in the mind alone considered as an immaterial being, or in both together, is of very little importance; because, taking the mind and its internal organs as one *metaphysical whole**, it matters not to our present inquiry, where this retentive power resides, as long as it can be proved to exist within us: for it seems evident, that what has the faculty of retaining a sensation when no longer acted upon by the object which excited it, must also have a power to preserve the vestiges of that sensation even after the sensation itself shall be entirely obliterated. This is in fact the case with the mind. When an object which we have once perceived is most remote from our thoughts, we are certain that there is within us a capacity, disposition, tendency, or power, by which a representation of that object may be at any time revived and presented to the intellect. Thus the same inherent power of the mind and its internal organs, which retains a sensation and perception in the absence of the object by which they were excited, can also reproduce that perception, or bring into the view of the intellect something exactly similar to it. The reproduction will not indeed be so lively as the original perception when accompanied with its corresponding sensation, because sensation and actual perception are effected by a double cause, the action of the external object upon the organ, nerves, and brain, and the corresponding energy of the mind or sentient principle: whereas, in the reproduction, the mind seems to act solely by its own power, and certainly without the assistance of external objects. This reproductive power is commonly called *memory*. By many of the ancient philosophers, and by *M. Schwab*, with one or two others among the moderns, it is called *imagination*. We do not choose either to revive antiquated modes of expression, or to introduce innovations of our own; but as we cannot disapprove of the ancient phraseology, after the definitions which the reader will by and by find of *imagination*, *memory*, and *recollection*, as given by Mr Harris, we have prefixed to this chapter the general title of *retention* which comprehends them all.

* See *An Essay on the Reduction of the Faculties of the Mind, by M. Schwab.*

56 The opinion of philosophers respecting memory.

When one recals an object of sight by the power of memory, it appears to him precisely the same as in the original survey, only less distinct, and with a conviction (which is perhaps the result of experience) that the real object is not immediately before him. How is an object recalled by the power of memory? Does the man endeavour to form in his mind a picture or representative image of the object? Let us listen to the answers given by different philosophers to this question.

57 The Peripatetics and Platonists.

The sentiments of the Peripatetics, as expressed by *Alexander Aphrodisiensis*, one of the earliest commentators on *Aristotle*, are thus translated by Mr Harris in his Hermes.—"Now, what fancy or imagination is, we may explain as follows: We may conceive to be formed within us, from the operation of the senses about sensible subjects, some impression (as it were), or picture in our original sensorium, being a relict of that motion caused within us by the external object; a relict which, when the external object is no longer present, remains, and is still preserved, being as it were its image; and which, by being thus preserved, becomes the cause of our having memory. Now such a sort of relict, and (as it were) impression, they call *fancy* or *imagination* (E)." A passage from ALCINOUS *of the doctrines of Plato*, as rendered into English by Dr Reid †, shows, that in this theory, as in that of perception, the Platonists agreed with the Peripatetics. "When the form or type of things is imprinted on the mind by the organs of the senses, and so imprinted as not to be deleted by time, but preserved firm and lasting, its preservation is called *memory*."

† *Essays on the Intellectual Powers of Man.*

Mr Harris, who was deeply read in the ancient philosophy, and who considered the authority of Aristotle and Plato as superseding all reasoning and all inquiry, after justly observing, that if the soul had no other faculties than the senses it could never acquire the least idea of *time*, thus expresses himself on the subject before us:—"But happily for us we are not deserted here. We have, in the first place, a faculty called *imagination* or *fancy*; which, however as to its *energies* it may be subsequent to sense, yet is truly prior to it both in *dignity* and *use*. This it is which *retains the fleeting forms of things*, when things themselves are gone, and *all sensation* is at an end. That this faculty, however connected with sense, is still perfectly different, may be seen from hence. We have an *imagination* of things that are gone and extinct; but no such things can be made objects of *sensation*. We have an easy command over the objects of our *imagination*, and can call them forth in almost what manner we please; but our *sensations* are necessary when their objects are present, nor can we control them but by removing either the objects or ourselves. As wax would not be adequate to its business of signature, had it not a power to retain as well as receive; the same holds of the SOUL, with respect to *sense* and *imagination*. SENSE is its *receptive* power; IMAGINATION its *retentive*. Had it sense without imagination, it would not be as wax but as water; where, though all impressions may be instantly made, yet as soon as made they are entirely lost. Thus then, from a view of the two powers taken together, we may call SENSE (if we please), *a kind of transient imagination*; and IMAGINATION, on the contrary, *a kind of permanent sense*."

58 distinguish properly between imagination and memory, &c.

Great part of the office which is here given to imagination, is in common English attributed to memory; but between these two faculties, as well as between them and recollection, the author accurately di-

(E) The original is as follows: Τι τοινυν εστιν ἡ φαντασια ωδε αν γνωρισαιμεν· δει νοειν εν ημιν απο των ενεργειων των περι τα αισθητα, οιον τυπον τινα αναζωγραφημα εν τω πρωτω αισθητηριω, εγκαταλειμμα τι της υπο του αισθητου γινομενης κινησεως, ὁ και μηκετι του αισθητου παροντος, υπομενει τε και σωζεται, ον ωσπερ εικον τις αυτου, ὁ και της μνημης ημιν σωζομενον αιτιον γινεται· το τοιουτον εγκαταλειμμα, και τον τοιουτον ωσπερ τυπον, φαντασιαν καλουσιν. *Alex Aphrod. de Anima*, p. 135. *Edit. Ald.*

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distinguishes thus:—"When we view some *relict* of sensation reposed within us, *without thinking of its rise, or referring it to any sensible object*, this is FANCY or IMAGINATION. When we view some such *relict*, and *refer it withal to that sensible object which in time past was its cause and original*, this is MEMORY. Lastly, the *road which leads to memory through a series of ideas however connected, whether rationally or casually*, this is recollection."

59 Objections to their theory.

Of this theory we shall only remark, that if we could understand the words *picture* and *form* in a metaphorical sense, as candor obliges us to understand Locke's *images* in the mind, the doctrine of *Alexander Aphrodisiensis* would be very little wide of the truth. Experience teaches us that memory as well as perception depends upon the state of the brain; and as it is undeniable, that when a man to-day contemplates an object which he perceived yesterday, or at any former period, he has a view of it in all respects similar to the original perception, only fainter and less distinct, it is extremely probable, that an impression *ab extra*, which produces a sensation and perception, leaves behind it some *tendency* in the brain, to vibrate as in the actual sensation, and that this *tendency* is carried into *effect* by the internal energy of the mind itself. But in the Peripatetic philosophy, *pictures* and *forms* in the *sensorium* were considered as real things, and by no means as metaphorical expressions. This is evident from their being constantly compared to the impression of a seal upon wax, and from their converting the *materia prima* from something, which can neither be seen nor felt, into visible and tangible body, of which we shall treat afterwards. Now it being certain that on a being immaterial, no corporeal *form* can be impressed, and repeated dissections having shown that no such forms are in fact impressed on the brain, this whole theory is at once overturned.

[59] Locke's doctrine concerning memory

Modern philosophers having denied that there are real *images* or *forms* in the mind during the immediate act of perception, cannot consistently with themselves admit such images in the act of retention, or when those things which were formerly objects of perception are recalled to the mind by the power of memory. Mr Locke's doctrine is, that "the mind retains these simple ideas which it first received from sensation or reflection, two ways: first, by keeping the idea, which is brought into it, for some time actually in view, which is called CONTEMPLATION: and secondly, by the power which we have to revive again in our minds those ideas, which, after imprinting, have disappeared, or have been, as it were, laid out of sight; as when we conceive heat or light, yellow or sweet, the object being removed. This (he says) is MEMORY; which is, as it were, the store-house of our ideas †.

To explain this more fully, he immediately adds the following observation:—"But our ideas being nothing but actual perceptions in the mind, which cease to be any thing when there is no perception of them, this laying up of our ideas in the repository of the memory, signifies no more but this, that the mind has a power, in many cases, to revive perceptions which it has once had, with this additional perception annexed to them, that it has had them before. And in this sense it is, that our ideas are said to be in our memories, when indeed they are actually nowhere; but only there is an ability in the mind, when it will, to revive them again, and, as it were, paint them anew on itself, though some with more some with less difficulty, some more lively and others more obscurely. And thus it is, by the assistance of this faculty, that we are said to have all those ideas in our understandings, which, though we do not actually contemplate them, yet we can bring in sight, and make appear again, and be the objects of our thoughts, without the help of those sensible qualities which first imprinted them there."

† Essay, Book ii. chap. 10.

To attempt a defence of the accuracy of this language would be vain; but as the author's meaning is sufficiently obvious, his expressions may be easily and certainly corrected. Had Locke said—"But our ideas being nothing but scenes or appearances in the mind, which cease to be any thing when there is no perception of them, this laying up of our ideas in the repository of the memory signifies no more but this, that the mind has a power, in many cases, to revive scenes which it has once viewed, with this additional perception annexed to them, that it has viewed them before;" there would have been no room for the many petulant remarks which have been made upon the passage.

60 Objected t

But against this account of memory, a much heavier charge has been brought than that which regards the propriety of the language. It has been said, that the additional perception, which, according to Locke, attends the revival of our ideas by the power of memory, "would be a fallacious perception, if it led us to believe that we had them before, since they cannot have two beginnings of existence: nor can we believe them to have two beginnings of existence; we can only believe that we had formerly ideas or perceptions very like to them, though not identically the same." Let us examine this question somewhat narrowly: for if it be really true, that in the sense in which the word *same* is here used, we cannot twice contemplate the same idea, all confidence in memory would seem to be at an end.

61 The objection obviated.

Suppose a man to stand on some of the rising grounds about Edinburgh, the Calton-hill for instance, and from that eminence to view the glorious prospect of the coast of Fife, the ocean, the frith of Forth, and the little islands scattered in the frith. Let him go away, and return next day to the same place, and look the same way: we would ask whether he has the same *view* or *perception* which he had the day before? The man must surely be very captious who would say that he has not: and yet it is certain that the energy of mind by which he perceives on one day cannot be identically the same with that by which he perceived on another; nor are the rays of light which fall upon his eyes on the second day, identically the same with those which fell upon his eyes and occasioned vision on the first day. Let the same man now shut his eyes, and contemplate the various objects at which he had been just looking. They will appear to him in all respects the same as when viewed by means of his organs of sight, only fainter and less distinct, with this additional conviction, that the immediate objects of his present contemplation are not real external things, but *ideas* or *mental representations* of those things which had so lately been the objects of his sight. Let him think no more about the matter for some

ſome days, and then exert his power of memory. We have no heſitation to ſay, that in the ſenſe of the word *ſame*, as uſed by Mr Locke, the very ſame ideas will recur and be preſent to his intellect which were preſent to it at the former contemplation. The ſecond energy of memory or imagination, or whatever it may be called, is not indeed identically the ſame with the firſt; nor is that agitation or motion, or whatever other affection of the brain is neceſſary to memory, identically the ſame at the ſecond time as at the firſt: but the mind exerting itſelf in the very ſame manner at the one time as at the other, produces the ſame kind of agitation in the brain, and is itſelf affected in the very ſame way at the ſecond as at the firſt exertion. Whence it follows, that the ſecond *ideal ſcene* will be as much the ſame with the firſt, as the ſecond *actual perception* is the ſame with the firſt; and the two ideal ſcenes, and the two actual perceptions, are reſpectively ſaid to be the ſame with each other, only becauſe they impreſs the mind with a conviction that they were occaſioned by the ſame external objects.

But though we think Locke's doctrine, with reſpect to memory, may be thus eaſily vindicated from the charge of fallaciousneſs, we muſt acknowledge that to us it appears not to be of much value. It teaches nothing, but that the mind has a power to retain ideas of thoſe objects which it formerly perceived, and in many inſtances to recal them as occaſion may require. But theſe are truths known to all mankind, to the clown as well as to the philoſopher.

62 he opinion of ume.

Philoſophers in general have paid leſs regard to the retentive faculties of the mind than to its original powers of perception. Perhaps they imagined, that as memory depends upon perception, and in ſome reſpects appears to reſemble it, a competent knowledge of the nature of the former faculty would lead to that of the ſecond. Be this as it may, Mr Hume, who was at ſome pains to detail his notions of perception, has in his Philoſophical Eſſays only dropt concerning memory and imagination a few hints, ſo looſely thrown together, that, if he had not elſewhere expreſſed himſelf with more preciſion, it would have been difficult to diſcover his real meaning. According to him, that which is commonly called the *perception of an external object*, is nothing but a ſtrong impreſſion upon the mind; and that which is called the *remembrance of a paſt object*, is nothing but a preſent impreſſion or idea weaker than the former. Imagination is an idea weaker than the idea or impreſſion which he calls *memory*. This ſeems to be a wonderful abuſe of language. Impreſſions are not perceptions; and, if poſſible, they can ſtill leſs be called *ideas*, which are but ſecondary perceptions. It is likewiſe far from being true, that an idea of imagination has neceſſarily leſs vivacity than an idea of memory. We have ſeen Mr Hume, and have at the preſent moment an idea of his form and dreſs: we can likewiſe imagine to ourſelves a centaur; and though a centaur was never ſeen, and therefore cannot be *an impreſſion repeated by memory*, our idea of the monſter is much more lively and diſtinct than that of the philoſopher.

63 Of Dr Reid.

Dr Reid having obſerved of memory *, that it is by it we have an immediate knowledge of things paſt; that it muſt have an object; that in this reſpect it agrees with perception, but differs from ſenſation, which has no object but the feeling itſelf; and that every man can diſtinguiſh the thing remembered from the remembrance of it—proceeds to inquire what memory is? And, " Firſt (ſays he), I think it appears that memory is an original faculty given us by the Author of our being, of which we can give no account but that we are ſo made. The knowledge (continues he) which I have of things paſt by my memory, ſeems to me as unaccountable as an immediate knowledge would be of things to come (F); and I can give no reaſon why I ſhould have the one and not the other, but that ſuch is the will of my Maker. I find in my mind a diſtinct conception and a firm belief of a ſeries of paſt events; but how this is produced I know not. I call it *memory*; but this is only giving a name to it; it is not an account of its cauſe. I believe moſt firmly what I diſtinctly remember; but I can give no reaſon of this belief. It is the inſpiration of the Almighty which gives me this underſtanding. When I believe the truth of a mathematical axiom or of a mathematical propoſition, I ſee that it muſt be ſo: every man who has the ſame conception of it ſees the ſame. There is a neceſſary and an evident connection between the ſubject and the predicate of the propoſition; and I have all the evidence to ſupport my belief which I can poſſibly conceive. When I believe that I waſhed my hands and face this morning, there appears no neceſſity in the truth of the propoſition. It might be or it might not be. A man may diſtinctly conceive it without believing it at all. How then do I come to believe it? I remember it diſtinctly. This is all I can ſay. This remembrance is an act of my mind. Is it impoſſible that this act ſhould be, if the event had not happened? I confeſs I do not ſee any neceſſary connection between the one and the other. If any man can ſhow ſuch a neceſſary connection, then I think that belief which we have of what we remember will be fairly accounted for: but if this cannot be done, that belief is unaccountable; and we can ſay no more but that it is the reſult of our conſtitution. Our original faculties are all unaccountable: Of theſe memory is one. He only who made them comprehends fully how they are made, and how they produce in us not only a conception, but a firm belief and aſſurance, of things which it concerns us to know."

On this account of memory we ſhall make no remarks. There is a certain ſenſe of the words, in which every thing which the author has ſaid on the ſubject is undoubtedly juſt; and it would be very uncandid to take

* *Eſſays on the Intellectual Powers of Man.*

(F) If memory depends upon the ſtate of the brain as it has been affected in paſt perceptions, this appears to us a ſtrange poſition. Perhaps the excellent author means nothing more, than that it is as unaccountable to us, that impreſſions on the brain ſhould cauſe perception, and the veſtiges of thoſe impreſſions ſhould cauſe remembrance, as how the mind might not perceive things to come without the intervention of impreſſions on the brain. If this be his meaning, no man will controvert it: for it is impoſſible to diſcover the nature of that relation which ſubſiſts between an impreſſion and perception; but that there is ſuch a relation, we know from experience.

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take his words in any other ſenſe. But though memory, as it is the reſult of that conſtitution which was given us by God, and not the offspring of habit or human contrivance, is unqueſtionably an original faculty; and though it is therefore impoſſible to account for it ſo fully as to ſilence every inquiry which may be made; yet we could wiſh that Dr Reid had beſtowed a little more pains upon it, in order to diſcover if poſſible in what reſpects it reſembles or differs from perception. He has well obſerved, that there are laws of nature by which the operations of the mind are regulated, as well as laws of nature which govern the material ſyſtem. As the latter are the ultimate concluſions which the human faculties can reach in the philoſophy of bodies, ſo the former are the ultimate concluſions which we can reach in the philoſophy of minds. The more general that theſe laws are in both caſes, the more uſeful they are and the more ſatiſfactory: for as they are themſelves inexplicable, the fewer they are in number, and the more comprehenſive each, the fewer will thoſe phenomena be for which we can give no account. Thus, as we know not what makes the planets tend to the centre of the ſun, or heavy bodies tend to the centre of the earth, we can give no other account of theſe phenomena, but that, as they appear to be of the ſame kind, it is reaſonable to conlude that they proceed from ſimilar cauſes. What the cauſe is of this tendency of bodies towards each other, we know not We call it *gravitation*, and employ it to account for all phenomena of the ſame kind. In like manner it is univerſally allowed, that as we know not how mind and matter operate upon each other, there is ſomething in perception wholly unaccountable. That perception follows ſenſation; and that there is no ſenſation which is not occaſioned by ſome affection of the brain, proceeding from ſome impreſſion *ab extra;* we have the evidence of experience: but how a particular affection of the brain ſhould excite a ſenſation in the mind, we know not; though we may here, as in the corporeal ſyſtem, attribute ſimilar effects to the ſame or ſimilar cauſes Thus, if when we exert an act of memory we have the ſame appearance of things as in the original act of perception, the rules of philoſophiſing authoriſe us to refer both phenomena to the ſame general law; juſt as they authoriſe us to refer the motion of the planets and of projectiles to the ſame general law. On the other hand, if we perceive no ſimilarity between memory and perception, we have made no progreſs in the philoſophy of mind; for in that caſe we have diſcovered two phenomena proceeding from two cauſes totally different from each other, and both inexplicable. Although we ſcarcely hope to throw any light upon a ſubject which Dr Reid has not attempted to illuſtrate, we ſhall ſtate a few facts reſpecting the memory, and ſubmit to the reader the concluſions to which we think theſe facts lead.

64 The appearance of ſenſible objects when recalled by the power of memory.

1. Objects once perceived by the ſenſes, when recalled to the mind by the power of memory, appear preciſely the ſame as in the original perception, only leſs diſtinct*. For example, having ſeen yeſterday a ſpreading oak growing on the bank of a river, and having heard a ſhepherd play, and handled a ſquare ſtone, we endeavour to recal to our minds theſe objects which are now abſent. How is this operation performed? Do we endeavour to form in our minds pictures of them or repreſentative images? or, does our intellect ſurvey the types or forms which, according to Ariſtotle, thoſe objects left in the imagination when originally perceived? Neither of theſe things is done. We conceive ourſelves as ſtanding in the ſame place where we ſtood yeſterday; upon which we have perceptions of the objects ſimilar in all reſpects to the perceptions which we had when we employed our eyes, our ears, and our hands. The tree appears, as it were, before us; faint indeed, but attended with all the objects which we obſerved around it yeſterday: we ſeem to hear the ſound of the pipe confuſedly, and at a diſtance; to move our hands over the ſtone, and to feel the ſame ſurfaces and the ſame angles which we felt in the original perception. In this recollection we are not conſcious of pictures or images more than in the original ſurvey. The perceptions ſeem to be of the tree and river themſelves, of the ſound itſelf, and of the ſtone itſelf, exactly as at the firſt; and yet we are ſatisfied that in the act of remembrance we perceive no ſuch object as a *real* tree, pipe, or ſtone. That theſe are facts, every man muſt be convinced who attends to the energies of his own mind when exerting the powers of retention: and therefore it is, in our opinion, with no impropriety that Mr Harris ſays, we may call SENSE, if we pleaſe, *a kind of tranſient imagination;* and IMAGINATION, on the contrary, *a kind of permanent ſenſe:* for if theſe two faculties, as far as the mind or intellect is concerned, be not the ſame, they ſeem to reſemble each other much.

* *Appendix to Elements of Criticiſm.*

65 What ideas remain longeſt in the memory.

2. The *primary* perception of a *viſible* object is more complete, lively, and diſtinct, and remains longer in the *ſenſorium*, than that of any other object. We know likewiſe by experience, that an *idea* or *ſecondary* perception of a viſible object is as much more complete, lively, and diſtinct, than the idea of any other object, as was the *primary* perception; and that we remember things which we have ſeen for a longer time than ſounds which we have heard, or than tangible objects which we have only handled. Yet there ſeems to be a conſtant decay of all our ideas, even of thoſe which are ſtruck (G) deepeſt and in minds the moſt retentive; ſo that if they be not frequently renewed by repeated exerciſe of the ſenſes, or by reflection on thoſe objects which at firſt occaſioned them, the print (G) wears out, and at laſt there remains nothing to be ſeen. Concerning ideas, it is eaſy to remark, that thoſe remain longeſt and cleareſt in the memory which are derived from two or more ſenſes, eſpecially if the ſenſe of ſight be one of the number, or which are ofteneſt refreſhed by a return of the objects which produced them. Hence a man has a longer and more diſtinct remem-

(G) Theſe expreſſions, which mention ideas as things which are *deep ſtruck*, and as *prints which wear out*, are the expreſſions of Locke. We hope it is needleſs to warn our readers, that they are uſed by us as they were by him in a metaphorical ſenſe. On theſe ſubjects it is impoſſible to write without metaphor; which, while the meaning is obvious, no man will condemn, who reflects that the words of language were not invented by metaphyſicians, and are for the moſt part *literally* ſignificant only of ſenſible objects.

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remembrance of what he has ſeen than of what he has only heard, of what he has both ſeen and felt than of what he has only ſeen; and the ideas which we have of heat and cold, of hunger and thirſt, and of all thoſe things which moſt frequently affect our ſenſes, are extremely clear, and are never quite loſt whilſt the mind retains any ideas at all.

66 Memory a kind of habit.

3. Memory appears to be a kind of habit, which is not always in exerciſe with regard to things we remember, but is ready to ſuggeſt them when there is occaſion. The moſt perfect degree of this habit is, when the thing preſents itſelf to our remembrance ſpontaneouſly, and without labour, as often as there is occaſion. A ſecond degree is, when the thing is forgotten for a longer or ſhorter time, even when there is occaſion to remember it, and yet at laſt ſome incident, ſuch as a violent paſſion *, which agitates the whole mind and ſenſorium, tumbles the idea, as it were, out of its dark corner, and brings it into view without any ſearch. A third degree is, when we call about and ſearch for what we would remember, and after ſome labour find it out. This ſearching faculty of the ſoul is by Ariſtotle called ἀνάμνησις, by Dr Reid and others *reminiſcence*, and by Mr Harris *recollection*. Should it be ſaid, that what we *will* to remember we muſt already conceive, as we can will nothing of which we have not a conception; and that, therefore, a *will* to remember a thing, ſeems to imply that we remember it already—we anſwer, with Dr Reid, that when we will to remember a thing, we muſt indeed remember ſomething relating to it; but we may have no poſitive idea or conception of the thing itſelf, but only of the relation which it bears to that other thing which we do remember. Thus, one remembers that a friend charged him with a commiſſion to be executed at ſuch a place, but he has forgotten what the commiſſion was. He applies himſelf to diſcover it; and *recollects* that it was given by *ſuch a perſon*, upon *ſuch an occaſion*, in conſequence of ſuch a *converſation*: and thus by a train of thought he is led to the very thing which he had forgotten and wiſhed to remember. To this operation it is not always neceſſary that the relations between the various ideas which the mind turns over be very cloſe, or have their foundation in nature; for a caſual connection is often ſufficient. Thus, from ſeeing a garment, we think of its owner; thence of his habitation; thence of woods; thence of timber; thence of ſhips; thence of admirals; thence of cannons, iron, furnaces, and forges, &c."

* *Reid's Eſſays on the Intellectual Powers of Man, Locke's Eſſay, &c. and Harris's Hermes.*

67 Recollection, one idea ſuggeſts another, and why.

That, in the proceſs of recollection, one idea ſhould ſuggeſt another, may be eaſily accounted for. When, in perception, our minds are expoſed to the influence of external objects, all the parts and properties, and even the accidental variable adjuncts of theſe objects, are perceived by full-grown men at the ſame time; ſo that the whole group makes but one impreſſion upon our organs of ſenſe, and conſequently upon the mind. By theſe means all the parts of the ſimultaneous impreſſion †, and conſequently of the perception occaſioned by that impreſſion, are ſo intimately aſſociated or linked together, that the idea of any one of them recurring at any future period, generally introduces the ideas of all the reſt. But as the neceſſary parts and properties of any thing are more cloſely linked together, and occur more frequently than any particular variable adjuncts, it is obvious, that by the idea of any one of theſe properties, the idea of the reſt, and of the object itſelf, will be more readily introduced than by the idea of any variable adjunct. It ſeems, however, to be certain, that we have no power of calling up any idea at pleaſure, but only ſuch as have a connection, either in nature or by means of former aſſociations, with thoſe that are at any time preſent to the mind. Thus the ſight, or the idea, of any particular perſon, generally enables us to recollect his name, becauſe his name and his perſon have been conſtantly aſſociated together. If that fail to introduce the name, we are at a loſs and cannot recollect it at all till ſome other aſſociated circumſtance help us. In naming a number of words in a ſentence, or lines in a poem, the end of each preceding word or line being connected with the beginning of the word or line which ſucceeds it, we can eaſily repeat them in that order; but we are not able to repeat them backwards with any eaſe, nor at all till after many fruitleſs efforts. By frequent trials, however, we acquire at laſt a facility in doing it, as may be found by making the experiment on the names of number from one to twenty. It is, indeed, probable, that in the wildeſt flights of *fancy*, no ſingle idea occurs to us but ſuch as had a connection with ſome other idea, perception, or notion, previouſly exiſting in the mind, as ſhall be ſhown more fully in a ſubſequent chapter.

† *Hartley on Man.*

68 Memory depends on the ſtate of the brain.

4. "Memory appears to depend entirely or chiefly upon the ſtate of the brain *. For diſeaſes, concuſſions of the brain, ſpirituous liquors, and ſome poiſons, impair or deſtroy it; and it generally returns again with the return of health, from the uſe of proper medicines and methods. It is obſervable, too, that in recovering from concuſſions and other diſorders of the brain, it is uſual for the perſon to recover the power of remembering the then preſent common incidents for minutes, hours, and days, by degrees; alſo the power of recalling the events of his life preceding his illneſs. At length he recovers this laſt power perfectly; and at the ſame time forgets almoſt all that paſt in his illneſs, even thoſe things which at firſt he remembered for a day or two. Now the reaſon of this ſeems to be, that upon a perfect recovery the brain recovers its natural ſtate, and all its former affections and tendencies; but that ſuch affections or tendencies as took place during the preternatural ſtate, *i. e.* during the patient's illneſs, are obliterated by the return of the natural ſtate." All this we are induced to believe; becauſe, though it is a fact incontrovertible, that in certain diſeaſes the memory is impaired, and recovers its vigour with the return of health, it is not conceivable that the mind itſelf ſhould ſuffer any change by diſeaſes, concuſſions, or ſpirituous liquors, &c.

* *Hartley on Man.*

From theſe facts we are ſtrongly inclined to conclude, that the power of the *mind*, or *immaterial* (H) *principle*

(H) Though the whole of this and the preceding chapters, we have taken it for granted that the ſentient principle in man is not material. This is the *common*, and, as ſhall be ſhown afterwards, the moſt *probable* opinion; but whether it be abſolutely certain or not, makes no difference on the theories of ſenſation and perception. Theſe are obviouſly neither figure nor motion, and therefore not ſubject to the laws which govern the material world.

ciple, by which it remembers paſt events, differs not from that by which it perceives preſent objects. In perception, impreſſions are made upon the organs of

69
External objects operating on the ſenſes leave ſome permanent effect in the brain.

ſenſe, which are communicated to the brain; and, by ſome unknown means, occaſion ſenſations which are followed by the perception of the external object. When by the power of memory we recal paſt objects of ſenſe, the mind has the ſame view of them as in the original perception, except that they appear fainter, leſs diſtinct, and generally more diſtant. We have, therefore, reaſon to conclude, that in the act of remembrance the brain is affected in the ſame way, though not ſo forcibly, as in perception. That memory depends as much as perception upon the ſtate of the brain, is confirmed by daily experience; and therefore there cannot be a doubt but that external objects, operating upon the ſenſes, nerves, and brain, leave ſome permanent effect behind them. What that effect preciſely is we cannot know, and we need not deſire to know; but that they leave *ſome* effect we have as good evidence as that the planets are moved round the ſun by forces of the ſame kind with thoſe by which projectiles are moved on the earth. Could we ſuppoſe that they leave real *prints* or *impreſſions* behind them, which we confeſs to be very little probable, memory would ſeem to be nothing but the perceptive power of the mind turned to thoſe impreſſions. If the permanent effect of impreſſions by external objects be, as Dr Hartley ſuppoſes, only a tendency in the brain to vibrate as in the original perception, remembrance will reſult from the mind's operating upon the brain as in actual perception; and the reaſon that ideas of memory are fainter than perceptions of ſenſe, is, that the former are produced by a ſingle, and the latter by a double, operation.

70
Why the memory advances to perfection, and then gradually decays.

This theory appears to be greatly confirmed by the following well-known facts, that children ſoon commit to their memory any thing which they underſtand, and as ſoon forget it; that the powers of memory gradually advance to perfection, and then gradually decay; and that old men remember more diſtinctly what they perceived in their youth, than what they perceived a year ago. For if the memory belonged wholly to the pure intellect, and had no dependence upon the brain, it is not eaſy to conceive how it ſhould advance towards a ſtate of perfection and afterwards decay. A being which is unextended and indiviſible, can ſuffer no change either in its eſſence or in its faculties: the ideas which it had once retained, it would retain forever. But if memory be occaſioned by ſome relict of ſenſe left in the brain, it is eaſy to ſee how all thoſe changes ſhould take place: and therefore, though we have the weight of Dr Reid's authority againſt us, we cannot help thinking that Ariſtotle was in the right, when he imputed the ſhortneſs of memory in children to this cauſe, that their brain is too moiſt and ſoft to retain impreſſions made upon it; and that he was likewiſe in the right, when he imputed the defect of memory in old men to the hardneſs and rigidity of the brain, which hinders it from receiving any durable impreſſion.

Another argument to prove, that in remembrance the mind acts upon ſomething left in the brain by the impreſſions of ſenſe, is this, that nothing can act but where it is preſent. The truth of this axiom is acknowledged by Dr Reid, and we believe by all mankind except Dr Prieſtley and one or two others, whoſe paradoxes we ſhall conſider afterwards. Now it is confeſſed, that in recollection at leaſt the mind is active; and therefore it muſt act, *not* upon an object which has now perhaps no exiſtence, and certainly no immediate exiſtence, *but* upon ſomething left by that object in the brain or ſenſorium, to which the mind is intimately preſent.

71
By what means we never confound memory with perception.

But if this be ſo, we may be aſked how it comes to paſs that men never confound memory with perception, nor fancy that they perceive things which they only remember? If perception be an inference drawn from certain ſenſations excited by an impreſſion on the brain, and if remembrance reſult from the mind's operating upon relicts of thoſe impreſſions, one would think it natural to ſuppoſe, that in both caſes we have actual perceptions, though in the one caſe the perception muſt be more vivid and diſtinct than in the other. To this we anſwer, That previous to all experience, perception and memory are very probably confounded; and that we believe a man brought into the world with all his faculties in their full *natural* perfection, would not inſtantly be able to diſtinguiſh what he remembered from what he perceived. This we know to be the caſe with reſpect to imagination, a faculty which ſtrongly reſembles memory; for in dreams, and ſometimes even in waking reveries, we fancy that we actually perceive things which it is certain we can only imagine. A very ſhort experience, however, would enable this newly created man to make the proper diſtinction between remembrance and perception. For let us ſuppoſe him to be brought into a dark room, and ſoon afterwards a candle to be introduced. The candle would give him a viſible ſenſation, though not at firſt the perception of an external object. Let the candle after ſome time be carried out: the man would retain a viſible *idea*, which he might confound with the actual ſenſation. But if, whilſt this idea remained in his mind, the candle were brought back, he would inſtantly feel a difference between the real ſenſation and the idea, when both were together preſent to his mind. And having, in ſome ſuch manner as we have already deſcribed, acquired the power of perceiving external objects by means of his ſenſes, he would ſoon diſcover, without any effort of his own, the difference between actual perceptions and the ideas treaſured up in his memory.

72
The order of ſucceſſion in which objects recur to the memory.

The only remaining difficulty which ſeems to encumber this theory of remembrance, is, to account for the order of ſucceſſion in which objects recur to the memory, and to which we give the name of *time*.—But this difficulty will vaniſh when we have aſcertained what *time* is. At preſent it is ſufficient to obſerve, that our perceptions of external objects remain a certain ſpace of time in the mind; that this time is different, according to the ſtrength and other circumſtances of the impreſſion which occaſioned the perception; and that traces of thoſe perceptions, *i. e. ideas*, may be recalled after the intervention of other trains of ideas, and at very different intervals. If one look upon a houſe, and then ſhut his eyes, the impreſſion which it made upon his mind will not inſtantly vaniſh:

nish: he can contemplate the house almost as long as he pleases; and, by the help of various associated circumstances, he may recal the idea several years afterwards, and refer it to the original perception.

73 Brutes have memory, and Before we dismiss the subject of retention, it may not be improper to take notice of the retentive powers of inferior animals. Aristotle, Locke, Dr Reid, and almost every philosopher of eminence both among the ancients and moderns, have maintained, that inferior animals have memory as well as men; and indeed we do not perceive how the fact can be denied of the more perfect animals, and those with whose operations we are best acquainted. A dog knows his master again after a long absence; a horse will trace back a road which he has but once travelled, often with more accuracy than his rider; and it is well known that many species of singing birds have a capacity to learn tunes from the human voice, and that they repeat the notes again and again, approaching nearer and nearer to perfection, till at last they sing the tune correctly. These phenomena can be accounted for only by supposing, that in the brains of the several animals traces are left by perception, of the same kind with those which perception leaves in the brain of man, and which are the cause or occasion of his remembrance. With respect to this point, the learned author of *Ancient Metaphysics* differs from his master Aristotle. He allows that brutes have imagination, but denies that they have memory: for (says he) "memory necessarily implies a sense of *time*, and what is *first* and *last*; but brutes have no idea of time, or of first and last; and it is certain that they have not consciousness or reflection, by which only they could review their own operations. At the same time he admits, that imagination in the brute serves the purpose of memory in us; for whenever he sees the object that is painted on his *phantasia*, he knows it again, but without any perception of the time when he first saw it." But that a brute, when he sees the object which is painted on his phantasia, should know it *again* without referring it to a former perception, is plainly impossible. The recognisance of any thing consists in a consciousness of its having been perceived before; and nothing more than such recognisance is essential to memory. The author's mistake seems to lie in supposing that memory necessarily implies a sense of some determinate portion of past time; but we surely remember many things of which we can only say that we have formerly perceived them, without being able to ascertain the precise period at which we had such perceptions. A child has the use of memory sooner than he acquires the faculty of speech; but he must have spoken and even reasoned before he can have an accurate notion of time, which, as shall be shown afterwards, arises from comparing the fleeting succession of our own ideas with the permanence of ourselves and other objects. The author's distinction between memory and imagination seems to be on all accounts improper. Aristotle has said, and said truly, that there is memory of *ideas* as well as of sensible objects; meaning by ideas general conceptions or propositions: but this reviver of his philosophy is inclined to say, "that *memory* is only of *ideas*, consequently belongs only to man; and that *imagination* is only of sensible objects, and consequently belongs both to man and brute."— But surely man *remembers* what he has *seen* and *felt* as well as what he has *conceived* or *thought*; and if imagination and memory be properly distinguished by Mr Harris, the reverse of this writer's doctrine must be true, viz. that imagination belongs only to *man*, and memory of sensible objects both to *man* and *brute*.— We can contemplate in imagination the idea of a *centaur* or a *golden mountain*; but we cannot be said to remember them, for they were never perceived. That a dog can contemplate in his imagination the idea of a *centaur* or of a *golden mountain*, we have not the least reason to suppose; but were he not capable of viewing relicts of sense reposed within him, and referring them to their original causes, he could not possibly recognise his master after a day's absence.

74 the power of recollection. Dr Reid and the same author agree with Aristotle, in thinking it probable that brutes have not reminiscence, or the power of recollection; but there are many well attested facts which seem to prove the contrary. We shall mention one which fell under our own observation. One of the persons concerned in this work was, when a young man, absent for five months from the house of his father. Upon his return, a dog of that species which is commonly called the *shepherd's cur*, and which had been in the possession of his father only a few months before his departure, gazed at him for a few minutes as at any other stranger. The animal then began to walk round him with looks which soon attracted his notice. This made him call the dog by the name which he bore in the family, and stretch out his hand to caress him, when the creature instantly leaped upon him with all that appearance of attachment which those animals so commonly exhibit upon the return of their master after a few days absence. If this was not recollection, we should be glad to know what it was, for we cannot distinguish it from recollection in men. Indeed, if dogs and some other animals possess, as Aristotle, Locke, and others, allow them to possess, the power of memory, and something of ratiocination; and if, as Dr Reid expressly says §, "they expect events in the same order and succession in which they happened before;" it is not conceivable that they can be wholly destitute of reminiscence, or the power of recollection.

§ *Essays on the Intellectual Powers of Man.*

75 Memory capable of improvement. That memory is a faculty of the first importance, cannot be denied; since it is obvious, that, without the power of retaining the ideas and notions which we receive by the senses and other faculties, we never could make any progress in the acquisition of knowledge, but should begin every day, nay every hour, in the same state of ignorance in which we are born. That it is a faculty capable of improvement by exercise, and that there are some methods of exercise better adapted for this purpose than others, has been shown elsewhere. See MEMORY.

CHAP. III. *Of* SIMPLE APPREHENSION *and* CONCEPTION.

76 Ideas of sensation the first materials of human knowledge. The ideas received into the mind by the senses, and treasured up in the memory and imagination, are the original materials of human knowledge. It is by comparing those ideas with one another, or by analysing them into their first principles, that we acquire all our knowledge in mathematics and philosophy,

and

and indeed all the knowledge which regulates our conduct through life. It must, therefore, be of importance to trace the progress of the mind in her various operations upon these materials; beginning, as she certainly begins, with that which is most simple, and proceeding regularly to those which are more complex and difficult.

77
Simple apprehension of ideas

Now the first operation of the mind about her ideas appears plainly to be that which logicians term *simple apprehension*. Having yesterday observed a *tree* or any other object, if we contemplate the idea of that tree to day as it remains in the imagination, without comparing it with any other idea, or referring it to any external object, we perform the operation which is called *simple apprehension*. We consider simple apprehension as an *operation*, because the mind in the apprehension of her own ideas is certainly active; she turns them, as it were, round and round, and views them on every side.

78
Different from conception.

Simple apprehension is a phrase which is commonly taken to be of the same import with the word *conception*; and in the ordinary affairs of life no confusion can arise from an indiscriminate use of the two words: but in this article we think it expedient to employ the phrase *simple apprehension*, to denote the view or contemplation of those ideas only which the mind by sensation has actually received from external objects; and the word *conception* to denote the view, not only of those ideas, but also of such as the mind fabricates to herself. Thus, a man may *conceive* a centaur, but we would not choose to say that he may *apprehend* a centaur: not that there is any impropriety, perhaps, in this last expression; but as there is certainly a difference between *apprehending* the idea of what has been seen or felt, and *conceiving* that which never existed, perspicuity requires that these different operations be expressed by different names.

79
In what sense it is true that we can conceive objects which never existed.

We have said that the mind may conceive what never existed; and every man may easily satisfy himself that what we have said is true: but though this has been frequently called the creative power of the mind, it has in fact no resemblance to *creation*. The materials of all our most complex and fantastic conceptions are furnished to our hands by sensation and reflection; nor can we form one simple idea which was not originally received by some of our senses from external objects, or, as shall be shown afterwards, one intellectual notion which was not acquired by reflecting on the operations of our own minds. To explain the process of fantastic conception, it is to be observed, that in every sensible object we perceive at once several things, such as *colour*, *figure*, *extension*, and *motion* or *rest*, &c. These are the objects of different senses: but they are not, at least by full grown men, perceived in succession, but all at once; whence it comes to pass that the memory, or the imagination, retains not several distinct and disjointed ideas, but the idea of *one coloured*, *figured*, and *extended object*. But when we compare various objects, or the ideas of various objects, together, we find that in some respects they agree and in others disagree; *i. e.* that several objects affect some of our senses in the same way, and other senses differently. Thus one globe is black, and another white; one black substance is circular and hard, and another square and soft. In the first instance, the two globes affect our sense of touch in the same way, and our sense of seeing differently; in the second, the two black substances affect our sense of sight in the same way, and our sense of touch differently.

From observing this difference among objects by means of the different sensations received from them, the mind learns to analyse its original ideas, which are copies of those sensations, into their first principles, and to combine those principles in such a manner as to form complex ideas of objects which were never actually perceived by the senses. Of the simple and unmixed principles which compose those complex ideas, there is not indeed one which was not originally received by some sense; so that the whole difference between complex ideas fabricated by the mind, and those which are the relicts of sensation, consists in the order in which the constituent simple ideas of each are put together. Thus, no man ever saw a mountain of pure gold; and therefore the idea of such a mountain can be in no human mind as a relict of sensation: but we have all seen pieces of gold of different sizes, and we have all seen mountains; and nothing is more easy than to *conceive* a piece of gold extended on all sides to the size of a mountain, and rising out of the earth. Again, though no person ever saw a centaur, yet it is easy to *conceive* the upper parts of a man joined to the breast and shoulders of a horse. In these instances, the complex conceptions are of things which it is in the highest degree probable never had a real existence, and which it is certain we never *perceived* as existing: but the simple ideas of which they are composed are the relicts of actual sensations; for every one has perceived as really existing the body of a horse and the upper parts of a man, and when conceiving a centaur he only perceives them to exist united. That we have not in the imagination one simple and unmixed idea which was not left there as a relict of sense, every man will be convinced who shall try to conceive a simple colour or taste which is totally different from all the colours and tastes, and all the shades and varieties of them, which he has received by sensation; but his simple ideas, though all received from without, he may put together in numberless manners, differing from any order in which he has ever actually perceived the qualities of external objects existing.

80
This p[…] of exe[…]tion li[…]ed to p[…]sible e[…]ence.

Yet even this power of the mind is limited. It is impossible to put together a number of *contrary* and *inconsistent* ideas, in such a manner as to form of them one complex conception. No man, for instance, can conceive a thing to be at once white and black, round and square, hard and soft, in motion and at rest.—Hence it is a maxim among philosophers almost universally received, that though we can conceive many things which never *actually* existed, yet we can form no ideas but of such things as *might possibly exist*. A centaur never existed, but it may be conceived; for it is by no means impossible that the head of a man might be joined to the body of a horse: but black snow cannot be *conceived*; for in the complex idea denoted by the word *snow* whiteness is an essential part, and nothing can be conceived to be both black and white at the same time. From this undoubted fact, that we cannot conceive impossible existence, the power of conception has by some writers in certain instances been made a test of truth. "In every idea is implied (says

Of Simple Apprehension and Conception.

(says Dr Price*) the possibility of the existence of its object; nothing being clearer, than that there can be no idea of an impossibility, or conception of what cannot exist." "It is an established maxim in metaphysics (says Hume), that whatever the mind conceives, includes the idea of possible existence; or, in other words, that nothing we imagine is absolutely impossible ‡." In a word, it has been admitted by all philosophers, from Pythagoras to Dr Reid, to be an axiom as evident and undeniable as any in Euclid, that whatever we can distinctly conceive is possible, though many things may be possible, nay, may really exist, of which we can form no conception.

This axiom has been denied by the author of the Essays on the Intellectual Powers of Man; who affirms, that "any two sides of a triangle may be conceived to be equal to the third," as distinctly as "any two sides of a triangle may be conceived to be greater than the third." This assertion from such a man surprised us as much as any paradox which we ever read: for nothing is more certain, than that *we* ourselves can form no conception of a triangle of which two of the sides are only equal to the third. We can, indeed, resolve the proposition into its different parts, and form the distinct and independent ideas of a *triangle*, *two sides*, and *one side*; and we can likewise form the general notion of *equality*: but to combine these ideas and this notion into one individual complex conception, we find to be absolutely impossible. A man who knows nothing of triangles, if such a man there be, might *believe* Dr Reid that it is a figure of which one of its sides is equal to the other two; but such a person would have no *conception* of the *figure itself*, but only a confidence in the Doctor's veracity.

What is it to *conceive* a corporeal thing to exist? Is it not to fancy that we view it on all sides, as what may be seen, or felt, or smelt, or tasted? The Doctor, indeed, repeatedly reprobates as the source of much error the notion of ideas as images in the mind; and if ideas be taken as real material figures, he is certainly in the right: But we appeal to the common sense of mankind, whether every person who distinctly *conceives a triangle*, is not at the time conscious that his mind is affected in a manner similar, though not so forcibly, as when he actually views a triangle with his eyes? What other men may feel, they know best; but we are as certain that this is the case with respect to ourselves, as we are certain of our own existence. That this affection of the mind is occasioned by some agitation in the brain, of the same kind with that which occasions actual perception, is highly probable; but whatever be the cause, the fact is undeniable.

The Doctor's words indeed, taken by themselves, would lead one to think, that by *conception* he means in this case nothing more than the understanding of the terms of a proposition: but if that be his meaning, there was no room for controversy; as the great philosophers *Cudworth*, *Clarke*, *Price*, and *Hume*, whose opinion he is combating, would have been as ready as himself to allow, that when a man is thoroughly master of any language, he will find no difficulty in understanding the meaning of any particular words in that language, however absurdly these words may be put together. When Dr Price says, that "in every idea is implied the possibility of the existence of its object, nothing being clearer than that there can be no idea of impossibility or conception of what cannot exist," his meaning evidently is, that we cannot mentally contemplate or fancy ourselves viewing any thing corporeal, which we might not actually view with our eyes, or perceive by some other sense (1). This is the true meaning of *conception*, which is something very different from understanding the separate meaning of each word in a proposition.

The learned professor, however, appeals to the practice of mathematicians for the truth of his opinion: and if they be on his side we must give up the cause; for in no science have we such clear ideas, or such absolute certainty, as in mathematical reasonings. But it is to be observed, that the word *conception* is with no propriety applied to *abstract truth*, but to *real* or *possible* existence; nor can we be said to conceive distinctly a *real* or *possible* object, unless we be able to turn it round and round, and view it on all sides.— The faculties which are conversant about *abstract truth* are the judgment and the reason; and truth itself consists in the agreement, as falsehood does in the disagreement, of two or more ideas or terms compared together. If those ideas about which the judgment is to be made can be immediately brought together, without the intervention of a third idea, it is impossible that we should *judge*, or, if Dr Reid will have it so, *conceive* that to be *true* which is *really false*. If the two ideas cannot be immediately brought together, it is impossible that we should form any *judgment* or *conception* at all about their *agreement* or *disagreement*: but we may *suppose* or *admit*, for the sake of argument, that they agree or disagree; and if that supposition conduct to a manifest absurdity, we then *know* that the supposition was false. It is, therefore, perfectly agreeable to the

(1) Dr Price may be thought by some to have contradicted in this passage what he had asserted in a former. He is a strenuous advocate for abstract and general ideas even of material objects: but those among the moderns who contend the most zealously for these, contend for them only as conceptions of the mind which can have no possible existence out of it. Were this likewise the opinion of Dr Price, he would certainly have fallen into a direct contradiction; but this is not his opinion. His notion of abstract ideas seems to be the same with that of Plato, who considers ideas, not only as the possibilities of existence, but as things actually existing from eternity, uncreated and independent even of the Supreme Mind. That Dr Price carries the matter thus far, we are unwilling to believe; but he certainly considers general ideas as real existences independent of *our* minds, though the immediate objects of our understanding. That in this notion he is mistaken, we shall endeavour to prove in the next chapter. It is enough for our present purpose to have shown that he does not contradict himself; and that he might with great propriety affirm on his own principles, as well as upon the principles of those who admit not of universal ideas, that in every idea is implied the possibility of its object.

Of Simple Apprehension and Conception

the max'm of Price and Hume, that mathematicians should in many cases prove some things to be possible and others impossible, which without demonstration would not have been believed; because if the ideas compared cannot be immediately brought together, no *judgment* previous to the demonstration can be formed of the truth or falsehood of the proposition; and if it concern not real or possible existence, it is a proposition with which *conception* has nothing to do.

"But (says Dr Reid) it is easy to *conceive*, that, in the infinite series of numbers and intermediate fractions, some one number integral or fractional may bear the same ratio to another as the side of a square bears to its diagonal." We are so far from thinking this an easy matter, that if the word *conceive* be taken in the sense in which it is used by the philosophers whose opinion he is combating, we must confess that we can form no adequate conception at all of an infinite series. When we make the trial, we can only bring ourselves to *conceive* the real numerical figures 1, 2, 3, &c. or the fractional parts $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c.; and even here our *conception* reaches but a small way.—We have reason to believe, that minds of a larger grasp can conceive at once more of the series than we can; and that the Supreme Mind conceives the whole of it, if the whole of a mathematical infinity be not a contradiction in terms: but surely no man will say that he can conceive an infinite series as he conceives a centaur, and have an adequate and distinct view of it at once. If, by conceiving that in an infinite series some one number may bear the same ratio to another that the side of a square bears to its diagonal, the Doctor only means that such a *supposition* may be made, his observation is not to the purpose for which it is brought; for the question is not about our power to make suppositions of this kind, but about our power to raise in our imaginations an adequate and distinct mental view of possible or impossible existence. "To suppose (says Johnson), is to advance by way of argument or illustration, without maintaining the truth of the position." In this sense a man may *suppose* that in an infinite series there may be some one number which bears the same ratio to another that the side of a square bears to its diagonal: but such a supposition contains in it nothing that is *positive*, which conception always does; it is only admitting, for the sake of argument, a position, of the truth or falsehood of which the person who makes the supposition knows nothing.—He is only talking of ratios as a blind man may talk of colours. A man born blind may be made to comprehend many of the laws of optics, and may make suppositions about colours, and reason from such suppositions to a certain extent, as clearly and justly as one who sees; but will any person say that a man blind from his birth can conceive *red* or *green?* It is much the same with respect to an infinite series. We can follow such a series so far, and may know the ratio by which it increases or decreases, and reason from what we know with the utmost certainty: but no man ever *conceived the whole of an infinite series* as he conceives an individual object; nor can any reasonings upon the nature of it be applied to the question of conceiving impossible existence.

But "mathematicians often require us (says Dr Reid) to conceive things that are impossible, in order to prove them to be so. This is the case in all their demonstrations *ad absurdum*. Conceive (says Euclid) a right line drawn from one point of the circumference of a circle to another, to fall without the circle. I conceive this, I reason from it, until I come to a consequence that is manifestly absurd, and from thence conclude that the thing which I conceived is impossible." If it be indeed true, that Euclid desires his readers to conceive a mathematical circle with a line drawn from one point of its circumference to another, and that line lying without the circle—if he really desires them to form such a complex conception as this, we have no hesitation to affirm, that he requires them to do what is manifestly impossible. The writer of this article has not in his custody any copy of the elements in the original Greek, and therefore cannot say with certainty what are Euclid's words, nor is it of much importance what they be; for on a question which every man may decide for himself, by looking into his own mind, the authority of Euclid is nothing.—The proposition to which the Doctor refers, is the second of the third book; and, in the edition of Simpson, is expressed thus: "If any two points be taken in the circumference of a circle, the straight line which joins them shall fall within the circle." Every mathematician who can form an adequate conception of a circle and a straight line, perceives the truth of this proposition instantly, for it results necessarily from his conception; but he who has not an adequate conception of a circle, *may* stand in need of a demonstration to show him the truth: for it is to be observed, that demonstration does not *make truth;* it only points it out to those who cannot perceive it intuitively, just as a microscope does not make the hairs on a mite's back, but only brings them within the field of vision.

Were a man who never examined a mite through a microscope, and who has no adequate ideas of the insect kingdom, to be asked whether there be hairs on a mite's back? he would probably answer that he did not know, but he could *conceive* no such hairs. In like manner, were a man who has no adequate conception of a mathematical circle, to be asked whether a straight line, which joins any two contiguous points in the circumference, could lie *without* the circle? he would probably answer that he did not know. Now it is to be remembered, that the reader of the Elements can have no very adequate conception of a circle when he comes to the second proposition of the third book. The definition of a circle was indeed given him in the introduction to the first book; but of that definition he has hitherto had occasion to make very little use, so that his idea of a circle will be little more accurate than that of an illiterate clown, who has no other idea of the figure than what he takes from a half-penny or a shilling. Dr Reid himself has elsewhere † well observed, that "when a youth of moderate parts begins to study Euclid, every thing at first is new to him. His apprehension is unsteady; his judgment is feeble; and rests partly upon the evidence of the thing, and partly upon the authority of his teacher: but every time he goes over the definitions, the axioms, the elementary propositions, more light breaks in upon him; the language becomes familiar, and conveys clear and steady conceptions." In this state he certainly

† See Kames Sketches of the History of Man; Appendix to the first Sketch on the sciences.

Simple apprehension and conception.

tainly is when he reads for the firſt time the ſecond propoſition of the third book: his conception of a circle can then be neither clear nor ſteady. Our young geometrician, however, muſt allow, that the propoſition is either true or falſe; and if he has read the preceding books with any advantage, he muſt have clear and ſteady conceptions of angles and triangles, and be able to demonſtrate many of their properties. "Well (ſays Euclid), though you have no adequate conception of a circle, you are well acquainted with plane angles and triangles, and many of their properties: let us ſuppoſe, if that be poſſible, that my propoſition is falſe, and I will ſhow you that the ſuppoſition is abſolutely inconſiſtent with what you know to be demonſtrable or ſelf-evident truth." This is all which Euclid can be ſuppoſed to require, when, in the words of his excellent tranſlator, he ſays, "If it (viz. the ſtraight line) do not fall within (the circle), let it fall, if poſſible, without." He could not poſſibly deſire a man who has an adequate idea of a circle, to form the poſitive and complex conception of that figure, with a ſtraight line touching two points of the circumference, and yet lying on the outſide of the circumference; becauſe all his figures and lines are mere conceptions, and not real material things; and ſuch a requeſt would have been the ſame thing as if he had ſaid, Conceive what cannot be conceived (K).

We have inſiſted the longer on this point, because we think it of the higheſt importance: for were it indeed true, that we could conceive impoſſible exiſtence, the conſequences would be very melancholy. Theſe conſequences it is needleſs to enumerate. Our readers will perceive, that if we could put together inconſiſtent ideas of ſenſible objects, and view them ſo united as one conſiſtent whole, nothing is clearer than that our faculties would be contrived to deceive us, and we would be doomed to cheerleſs and univerſal ſcepticiſm.

Chap. IV. *Of* Abstraction *and* general Ideas.

83 Every ſenſible object is an individual, and every ideas are individual.

Every ſenſible object is an individual, and differs in many reſpects from every other object. As ſuch it is perceived by the ſenſes; and ideas being nothing more than relicts of ſenſation preſerved in the imagination or memory, every idea muſt of courſe be an individual, as much as the object to which it refers. But all ſcience, whether mathematical, moral, or metaphyſical, is converſant about general truths; and if truth conſiſt, as we have already obſerved, and ſhall more fully evince afterwards, in the agreement or coincidence of ideas, how, it may be aſked, can general truth reſult from the compariſon of particular ideas? To get rid of this difficulty, many philoſophers, both ancient and modern, pretend that the mind is furniſhed with *general ideas*, from a compariſon of which reſult general propoſitions applicable to many individuals. Philoſophers, indeed, have differed in opinion reſpecting the ſource of thoſe ideas; ſome of the ancients deriving them immediately from the ſupreme mind to the human, whilſt almoſt all the moderns ſay that they are framed by abſtraction, and therefore call them *abſtract ideas*.

Of Abstraction and general Ideas.

84 The doctrine of abſtract ideas ſtated, and

The doctrine of *abſtract* ideas has been ſo fairly ſtated, and, in our opinion, ſo completely overturned, by Biſhop Berkeley, that we ſhall content ourſelves with abridging what he has ſaid on the ſubject, and obviating ſome cavils which have lately been urged againſt his reaſoning. "It is agreed on all hands (ſays that learned and ingenious prelate †), that the qualities or modes of things do never really exiſt each of them apart by itſelf and ſeparated from all others; but are mixed, as it were, and blended together, ſeveral in the ſame object. But, we are told, the mind being able to conſider each quality ſingly, or abſtracted from thoſe other qualities with which it is united, does by that means frame to itſelf abſtract ideas. For example: There is perceived by ſight an object extended, coloured, and moved: this mixed or compound idea, the mind reſolving into its ſimple conſtituent parts, and viewing each by itſelf excluſive of the reſt, does frame the abſtract ideas of extenſion, colour, and motion. Not that it is poſſible for colour or motion to exiſt without extenſion; but only that the mind can frame to itſelf by *abſtraction* the idea of colour excluſive of extenſion, and of motion excluſive of both colour and extenſion. Again, the mind having obſerved, that in the particular extenſions perceived by ſenſe, there is ſomething common and alike in all, and ſome other things peculiar, as this or that figure or magnitude, which diſtinguiſh them from one another; it conſiders apart, or ſingles out by itſelf, that which

† *Introduction to the Principles of Human Knowledge.*

(K) Principal Campbell, treating of the commonly received doctrine of abſtraction, and having ſhown, that though Locke has in one paſſage of his immortal work expreſſed himſelf on the ſubject in terms unintelligible, his ſentiments on the whole differed little from thoſe of Berkeley and Hume, adds—"Some of the greateſt admirers of that eminent philoſopher ſeem to have overlooked entirely the preceding account of his ſentiments on this ſubject; and, through I know not what paſſion for the paradoxical (I ſhould rather ſay the impoſſible and unintelligible), have ſhown an amazing zeal for defending the propriety of the haſty expreſſions which appear in the paſſages formerly referred to. Has not the mind of man (ſay they) an unlimited power in moulding and combining its ideas? The mind, it muſt be owned, hath an unlimited power in moulding and combining its ideas. It often produces wonderful forms of its own out of the materials originally ſupplied by ſenſe; forms indeed of which there is no exemplar to be found in nature:—centaurs and griffins,

Gorgons and hydras, and chimeras dire.

But ſtill it muſt not attempt abſolute impoſſibilities, by giving to its creature contradictory qualities. It muſt not attempt to conceive the ſame thing to be black and white at the ſame time; to be no more than three inches long, and yet not leſs than three thouſand; to conceive two or more lines to be both equal and unequal; the ſame angle to be at once acute, obtuſe, and right;" or, we may add, the two ſides of a triangle to be not greater than the third. See *Philoſophy of Rhetoric*, vol. ii. p. 108, &c.

which is common, making thereof a moſt abſtract idea of extenſion, which is neither line, ſurface, nor ſolid, nor has any figure or magnitude, but is an idea entirely preſcinded from all theſe. So likewiſe the mind, by leaving out of the particular colours perceived by ſenſe that which diſtinguiſhes them one from another, and retaining that only which is common to all, makes an idea of colour in abſtract, which is neither red, nor blue, nor white, nor any other determinate colour. And as the mind frames to itſelf abſtract ideas of qualities or modes, ſo does it by the ſame preciſion or mental ſeparation attain abſtract ideas of the more compounded beings, which include ſeveral coexiſtent qualities. For example: The mind having obſerved that *Peter*, *James*, and *John*, reſemble each other in certain common agreements of ſhape and other qualities, leaves out of the complex or compounded idea it has of *Peter*, *James*, and any other particular man, that which is peculiar to each, retaining only what is common to all, and ſo makes an abſtract idea wherein all the particulars equally partake, abſtracting entirely from and cutting off all thoſe circumſtances and differences which might determine it to any particular exiſtence. After this manner, it is ſaid, we come by the abſtract idea of *man*, or, if you pleaſe, humanity or human nature: in which, it is true, there is included colour, becauſe there is no man but has ſome colour; but then it can be neither *black* nor *white*, nor any *particular* colour, becauſe there is no one particular colour wherein all men partake. So likewiſe there is included ſtature; but then it is neither tall ſtature, nor low ſtature, nor middle ſtature, but ſomething abſtracted from all theſe; and ſo of the reſt. Moreover, there being a great variety of other creatures that partake in ſome parts, but not all, of the complex idea of *man;* the mind, leaving out thoſe parts which are peculiar to man, and retaining thoſe only which are common to all the living creatures, frameth the idea of *animal*; which abſtracts not only from all particular men, but alſo from all birds, beaſts, fiſhes, and inſects. The conſtituent parts of the abſtract idea of animal, are body, life, ſenſe, and ſpontaneous motion. By *body*, is meant body without any particular ſhape or figure, there being no one ſhape or figure common to all animals, without covering either of hair or feathers or ſcales, &c. and yet not naked; hair, feathers, ſcales, and nakedneſs, being the diſtinguiſhing properties of particular animals, and for that reaſon left out of the *abſtract idea.* Upon the ſame account, the ſpontaneous motion muſt be neither walking, nor flying, nor creeping: it is nevertheleſs motion; but what that motion is, it is not eaſy to conceive.

85 controverted; and

"Whether others have this wonderful faculty of *abſtracting their ideas* (continues the Biſhop), they beſt can tell; for myſelf, I find indeed that I have a faculty of imagining or repreſenting to myſelf the ideas of thoſe particular things which I have perceived, and of variouſly compounding and dividing them. I can imagine a man with two heads, or the upper parts of a man joined to the body of a horſe. I can conſider the hand, the eye, the noſe, each by itſelf abſtracted or ſeparated from the reſt of the body. But then, whatever hand or eye I imagine, it muſt have ſome particular ſhape, and ſome particular colour.—Likewiſe the idea of man that I frame to myſelf, muſt be either of a white, or a black, or a tawney, a ſtraight or a crooked, a tall or a low, or a middle-ſized man. I cannot by any effort of thought conceive the abſtract idea above deſcribed. To be plain, I own myſelf able to abſtract in one ſenſe, as when I conſider ſome particular parts or qualities ſeparated from others, with which, though they are united in ſome objects, yet it is poſſible they may really exiſt without them. But I deny that I can abſtract one from another, or conceive ſeparately thoſe qualities which it is impoſſible ſhould exiſt ſo ſeparated; or that I can frame a general notion by abſtracting from particulars in the manner aforeſaid; and there are grounds to think moſt men will acknowledge themſelves to be in my caſe."

86 ſhown to be abſurd.

To think this, there are indeed ſuch good grounds, that it is probable ſome of our readers, little converſant with the writings of modern metaphyſicians, are by this time diſpoſed to ſuſpect, that the Biſhop in his zeal may have miſrepreſented the doctrine of *abſtraction;* as no man in his ſenſes, who is not perverted by ſome darling hypotheſis, can ſuppoſe himſelf capable of tagging together ſuch monſtrous inconſiſtencies, as magnitude which is neither large nor ſmall, and colour which is neither white, red, green, nor black, &c. But that the ingenious prelate, in his account of this proceſs of *lopping* and *pruning*, as Mr Harris contemptuouſly, but moſt properly, terms it, has not exaggerated in the ſmalleſt degree, is apparent from the following account of *abſtraction* given by Mr Locke. "*Abſtract ideas* (ſays that writer) are not ſo obvious or eaſy to children, or the yet unexerciſed mind, as particular ones. If they ſeem ſo to grown men, it is only becauſe by conſtant and familiar uſe they are made ſo: for when we nicely reflect upon them, we ſhall find that general ideas are fictions and contrivances of the mind that carry difficulty with them, and do not ſo eaſily offer themſelves as we are apt to imagine. For example, Does it not require ſome pains and ſkill to form the general idea of a triangle (which is yet none of the moſt abſtract, comprehenſive, and difficult)? for it muſt be neither oblique nor rectangle, neither equilateral, equicrural, nor ſcalenon, but *all and none of theſe at once.* In effect, it is ſomething imperfect that cannot exiſt, an idea wherein ſome parts of ſeveral different and *inconſiſtent* ideas are put together." "Surely (to uſe the words of principal Campbell *) the bare *mention* of this hypotheſis is equivalent to a confutation of it, ſince it really confutes itſelf." But if any man has the faculty of framing in his mind ſuch an idea of a triangle as is here deſcribed, it would be vain in us to diſpute with him; for we are poſſeſſed of no ſuch faculty, and therefore would fight on unequal terms. All we have to deſire is, that the reader would fully and certainly inform himſelf whether he has ſuch an idea or not; and this can be no hard taſk to perform. What is more eaſy for any one than to look a little into his own thoughts, and there try whether he has, or can attain to have, an idea of *colour* ſeparated from all *extenſion;* of *extenſion*, which is neither *great* nor *ſmall;* of *taſte*, which is neither *ſweet* nor *bitter*, nor *acid*,

* Philoſ. of Rhet.

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acid, nor *agreeable*, nor *disagreeable*; or the general idea of a triangle, which is neither *oblique* nor *rectangle*, *equicrural*, *equilateral*, nor *scalenon*, *but all and none of these at once* (L)?

7 Abstract conceptions the same as abstract ideas.

Dr Reid having denied that there are or can be in the mind any *ideas* of sensible objects, rejects of course the doctrine of *abstract general ideas*, whilst he maintains in fact the same thing, only substituting the word *conception* for the word *idea*. "What hinders me (says he) from attending to the whiteness of the paper before me, without applying that colour to any other object?" We know nothing indeed which can hinder any man from performing this operation, which is daily and hourly performed by infants; but will the Doctor say, that he can attend to colour, or conceive it, abstracted from the paper and every other surface? We are persuaded he will not, though he immediately adds, "the whiteness of this individual object is an *abstract conception*." Now we should rather have thought, that, consistent with his own notions of colour, he would have called the whiteness of the paper a *concrete quality*, and his own conception of it a *particular* and *concrete conception*. If he conceives the whiteness as separated from the paper, it is no longer the whiteness of that individual object: and he must either conceive it as abstracted from *all* objects, which is plainly impossible: or he must conceive it as inhering in some other object; and then neither the quality of whiteness, nor his conception of it, is abstract and general, but concrete and particular. He affirms, however, "that in abstraction, strictly so called, he can perceive nothing that is difficult either to be understood or practised." This is going much farther into the doctrine than Mr Locke went; for he owned that there was much difficulty in it. Let us see how it becomes so easy to Dr Reid. "What can be more easy (says he) than to distinguish the different attributes which we know to belong to a subject? In a man, for instance, to distinguish his size, his complexion, his age, his fortune, his birth, his profession, and twenty other things that belong to him." All this indeed, and much more, we can do with the utmost ease; but this is not abstraction, strictly so called, nor any thing like abstraction. We distinguish the size, the complexion, the age, &c. of the man, from *one another*: but still we conceive them all as *his* qualities; nor is it possible, at least for us, *to abstract them from him*, without conceiving them as the qualities of some *other* man; so that *our* conceptions are all concrete and particular. "It ought likewise to be observed (says the Professor), that attributes may with perfect ease be distinguished and *disjoined* in our conception, which cannot be *actually separated* in the subject." They may be so in his conception, but certainly not in ours; for *we* can conceive nothing which may not actually exist. "Thus (continues he) I can in a body distinguish its solidity from its extension, and its weight from both. In extension, I can distinguish length, breadth, and thickness; yet none of these can be separated from the body, or from one another. It is therefore *certain*, that attributes, which in their nature are absolutely inseparable from their subject and from one another, may be disjoined in our conception; one *cannot exist* without the other, but one *can be conceived* without the other." So far is this from being a matter of *certainty*, that in every possible sense in which we can understand the word *conception*, it apppears to us as evidently *false*, as that *three* and *two* are equal to *nine*. It is indeed not difficult to distinguish *in* a body its solidity from its extension, and its weight from both: but can we distinguish them *out* of the body? or, to speak in plain language, can we conceive *solidity* as separated from *all extension* and *all weight*? Unless this can be done, and by *us* it cannot be done, there is no *abstraction strictly so called*. It is indeed easy to conceive *solidity* or *extension* abstracted from *any one* individual object: but how is it done? Why, by transferring your attention to some other *individual object*. Thus, we can easily conceive *solidity* or *extension* separated from a guinea, for instance; but it is only by transferring our thoughts to another body, *a piece of silver*, or a *ball of lead*, &c. and our conceptions in both cases are *particular* and *concrete*.

As we think this opinion of Dr Reid's respecting ABSTRACTION both ill-founded and of dangerous consequences, we have expressed our dissent from it in strong terms; and in doing so we have only followed the example set us by himself when dissenting from the theories of Hume and Berkeley. But we are so thoroughly convinced that the Doctor's acuteness is superior to our own (L), that we are not without our fears that we may have mistaken his meaning. We are conscious that we have not wilfully misrepresented it; and to enable our readers to judge for themselves between him and us, we shall lay before them his definition of *general conceptions* in his own words.

83 Terms, how they are

That there are in every language *general terms*, is known to all mankind: for such are all substantives, proper names excepted; and all adjectives. But "it is impossible (says the Doctor*) that words can have a general signification, unless there be conceptions in the

* *Essay on the Intellectual Powers of Man.*

(L) "If such an extraordinary faculty (abstraction) were possible, I cannot for my part conceive what purpose it could serve. An idea hath been defined by some logicians, the form or resemblance of a thing in the mind; and the whole of its power and use in thinking is supposed to arise from an exact conformity to its archetype. What then is the use or power of that idea, to which there neither is nor can be any archetype in nature, which is merely a creature of the brain, a monster that bears not the likeness of any thing in the universe!"—— *Philosophy of Rhetoric*, vol. ii. p. 110.

(L) Notwithstanding this declaration, which is made with the greatest sincerity, we do not apprehend that we are guilty of presumption when we examine the Doctor's opinions. Berkeley and Hume were certainly as acute as any metaphysician who has succeeded them; yet their opinions have been canvassed without ceremony, and to much advantage. *Aliquando bonus dormitat Homerus.*

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the mind of the ſpeaker and of the hearer, of *things* (M) that are *general*. It is to ſuch that I give the name of *general conceptions*: and it ought to be obſerved, that they take this denomination, not from the act of the mind in conceiving, which is an individual act; but from the object or thing conceived, which is general." Now, whatever is conceived, muſt be either *external* to the mind, or *preſent* with it. But the Doctor himſelf acknowledges, "That all the objects we perceive are individuals. Every object of ſenſe, of memory, or of *conſciouſneſs*, is an individual object. All the good things we enjoy or deſire, and all the evils we feel or fear, muſt come from individuals; and I think we may venture to ſay, that every creature which God has made in the heavens above, or in the earth beneath, or in the waters under the earth, is an individual." If this be ſo, and no man can call it in queſtion, it is obvious that we can have no *general* conception of any thing *external*. The *act* of conceiving is *an individual act*; and therefore the only thing which can be *general*, muſt be ſomething preſent with the mind, and different from the *mere act of conceiving*: But what can this be, if not what Berkeley and others call an *idea*? and how can we have an *idea* of which we are not *conſcious*? yet every thing of which we are conſcious Dr Reid himſelf acknowledges to be an *individual*.

89 Of general ſignification.

But if the doctrine generally received reſpecting abſtract ideas be ſo very abſurd as it has appeared in our repreſentation, how comes it to be ſo prevalent among the acuteſt philoſophers? To this we anſwer, that thoſe philoſophers have certainly in this inſtance been impoſed upon by the ſtructure of language. Every adjective and every ſubſtantive, proper names excepted, are words of general ſignification; and all ſcience is converſant about general truth: but as words are ſaid to be ſignificant, not of things, but of ideas; and as truth reſults from the agreement or coincidence of ideas; it has been haſtily ſuppoſed, that without general ideas there could have been neither general terms nor general truth. This is plauſible, but it is not ſolid. Every object which affects our ſenſes is an individual object; but we perceive that two or more objects which affect ſome of our ſenſes very differently, affect others of them in preciſely the ſame way. Thus, the paper upon which one writes, the ſnow which he perceives from his window, and the milk which he may uſe at breakfaſt, affect his ſenſes of touch and taſte very differently, but they preſent the ſame appearance to his eye. This diverſity in the one caſe he believes to proceed from different powers or qualities in the ſeveral objects; and the ſameneſs of appearance in the other, from ſimilar qualities in theſe objects. To the ſimilar qualities, though he can frame no idea of them abſtracted from every individual object, he gives one common name; and calls every object which preſents the ſame appearance to his eye that ſnow does, a *white* object; where the word *white* does not ſtand for an abſtract idea, but for a quality inherent in one or more objects. Hence the origin of adjectives in language, which denote more than can be expreſſed by any claſs of ſubſtantives; for every adjective, beſides the power of a name, includes in itſelf the force of a conjunction. See GRAMMAR.

The other claſs of general terms comprehends ſubſtantives: of which the origin is as follows. The objects about which we have occaſion to ſpeak or write are ſo numerous and ſo fluctuating, that if every individual had a proper name, a complete language could never be formed. But as there are not perhaps in nature two objects that appear to us ſimilar in all reſpects, ſo are there not in nature two objects which affect *all* our ſenſes differently. The mind, therefore, either actually perceiving two or more objects at once, or contemplating the *ideas* left by two or more objects in the memory, perceives, by its intellective power, in what reſpects they agree and in what they diſagree. If the agreement be ſtriking, and in more qualities than one, it combines the ſeveral individuals into one claſs or ſpecies, giving to the whole a common name, which equally denotes the ſpecies and every individual belonging to it. Thus, obſerving that Peter, James, and John, agree in having the ſame erect form, in walking on two legs, in having hands, &c. and in being endowed with reaſon, we combine theſe three, and all other individuals which we perceive to agree in the ſame ſtriking and important qualities, into one ſpecies, to which we give the name of *man*—a word which equally denotes the whole ſpecies and every individual of it. Again, contemplating ſeveral figures, which all agree in the circumſtance of being bounded by three ſtraight lines meeting one another ſo as to form three angles, we call the whole claſs of figures and each individual by the name of *triangle*—though it may be impoſſible to contemplate any number of triangles without perceiving that all the angles of one are acute; that one angle of another is a right angle; and that in the third there is one angle obtuſe: but the word *triangle*, unleſs it is limited in its ſignification by the addition of an adjective, is equally expreſſive of an acute-angled triangle, a right-angled triangle, and an obtuſe-angled triangle. By thus arranging individuals according to their moſt conſpicuous qualities, we may combine all the objects exiſting into ſo many claſſes or ſpecies, which ſhall be afterwards known by as many names; but of each ſpecies we neither have, nor can have, any other idea than that of a multitude of ſimilar individuals.

As our acquaintance with nature enlarges, we diſcover reſemblances ſtriking and important between one ſpecies and another, which naturally begets the notion of a higher claſs called a *genus*. From comparing man with beaſts, birds, fiſhes, and reptiles, we perceive that they are all alike poſſeſſed of life, or a principle of ſenſation and action, and of an organiſed body: hence we rank them all under a higher claſs or genus, to which we give the name of *animal*; which equally denotes the whole *genus*, each *ſpecies* comprehended under the *genus*, and every *individual* of every *ſpecies*. Thus, *animal* is a *genus*; *man*, *beaſt*, *bird*, are ſo many *ſpecies* comprehended under that *genus*; and *Peter*, *James*, and *John*, are *individuals* of the ſpecies *man*. *Peter*, *James*, and *John*, are proper names, denoting each an *individual*;

(M) He tells us ſoon afterwards, that there are *no things general*. How is the one paſſage to be reconciled with the other?

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dual; *man*, *beaſt*, *bird*, are *ſpecific* terms, denoting each a *whole ſpecies* compriſing many *individuals*; and *animal* is a *general term*, becauſe it denotes a *whole genus*, comprehending under it *ſeveral ſpecies*, of which each conſiſts of *many individuals*; and the general term denotes either the whole *genus*, all the *ſpecies*, or any *individual* of all the ſpecies. This is the whole myſtery of *abſtraction*: they are merely *terms*, that in ſtrictneſs of ſpeech are *general* and *abſtract*; and even theſe are general only as *ſigns*, of which the full ſignification cannot always be repreſented by any conceivable *idea*.

90 Ideas and often mere signs.

"It is a received opinion (ſays Biſhop Berkeley), that language has no other end but the communicating of our ideas, and that every ſignificant name ſtands for an idea. This being ſo; and it being withal certain, that names, which yet are not thought altogether inſignificant, do not always mark out particular conceivable ideas; it is ſtraightway concluded that they ſtand for abſtract notions. That there are many names in uſe amongſt ſpeculative men, which do not always ſuggeſt to others determinate particular ideas, is what nobody will deny: and a little attention will diſcover, that it is not neceſſary, even in the ſtricteſt reaſonings, that ſignificant names, which ſtand for ideas, ſhould every time they are uſed excite in the underſtanding the ideas they are made to ſtand for. In reading and diſcourſing, names are for the moſt part uſed as letters in algebra; in which, though a particular quantity be marked by each letter, yet to proceed right, it is not requiſite that in every ſtep each letter ſuggeſt to our thoughts that particular quantity it was appointed to ſtand for." The ſame thing is true of ideas, which as well as names are often uſed merely as ſigns repreſenting a whole claſs; and on that account they may be called *general*, though every idea is in itſelf ſtrictly particular. Thus, "An idea, which conſidered in itſelf is particular, becomes general by being made to repreſent or ſtand for all other particular ideas of the ſame ſort. To make this plain by an example, ſuppoſe a geometrician is demonſtrating the method of cutting a line in two equal parts: He draws, for inſtance, a black line of an inch in length: this, which in itſelf is a particular line, is nevertheleſs, with regard to its ſignification, general; ſince, as it is there uſed, it repreſents all particular lines whatſoever: ſo that what is demonſtrated of it is demonſtrated of all lines, or, in other words, of a line in general. And as that particular line becomes general by being made a ſign; ſo the *name* line, and the *idea* of a line in the imagination, either of which taken abſolutely is particular, by being ſigns are made general likewiſe. And as the former owes its generality, not to its being the ſign of an abſtract or general line, but of all particular right lines that may poſſibly exiſt; ſo the latter, the name and the idea, muſt be thought to derive their generality from the ſame cauſe, namely, the various particular lines which each of them indifferently denotes." Again, when one demonſtrates any propoſition concerning triangles, it is to be ſuppoſed that he has in view to demonſtrate an univerſal truth; yet the particular triangle which he conſiders muſt be either equilateral, iſoſceles, or ſcalenon; for a plain triangle, which is none of theſe, can neither exiſt nor be conceived. But whether it be of this or that ſort is of no importance, as any of them may equally ſtand for and repreſent all rectilineal triangles, and on that account be denominated *univerſal*.

This doctrine reſpecting names and ideas being uſed merely as *ſigns*, has been adopted by almoſt every ſubſequent philoſopher; and by Principal Campbell it has been illuſtrated with perſpicuity and acuteneſs every way worthy of the author of the Diſſertation on Miracles. "In confirmation of this doctrine (ſays he *), it may be obſerved, that we really think by *ſigns*, as well as ſpeak by them. All the truths which conſtitute ſcience, which give exerciſe to reaſon, and are diſcovered by philoſophy, are general; all our ideas, in the ſtricteſt ſenſe of the word, are particular. All the particular truths about which we are converſant are properly hiſtorical, and compoſe the furniture of memory. Nor do I include under the term *hiſtorical* the truths which belong to natural hiſtory; for even theſe too are general. Now, beyond particular truth or hiſtorical facts, firſt perceived and then remembered, we ſhould never be able to proceed one ſingle ſtep in thinking any more than in converſing, without the uſe of ſigns.

* *Philoſophy of Rhetoric.*

"When it is affirmed that *the whole is equal to all its parts*, there cannot be an affirmation which is more perfectly intelligible, or which commands a fuller aſſent. If, in order to comprehend this, I recur to ideas, all that I can do is to form a notion of ſome individual whole, divided into a certain number of parts of which it is conſtituted; ſuppoſe of the year, divided into the four ſeaſons. Now all that I can be ſaid to diſcern here is the relation of equality between this particular whole and its component parts. If I recur to another example, I only perceive another particular truth. The ſame holds of a third and of a fourth. But ſo far am I, after the perception of ten thouſand particular ſimilar inſtances, from the diſcovery of the univerſal truth, that if the mind had not the power of conſidering things as ſigns, or particular ideas as repreſenting an infinity of others, reſembling in one circumſtance though totally diſſimilar in every other, I could not ſo much as conceive the meaning of an univerſal truth. Hence it is that *ſome ideas*, to adopt the expreſſion of Berkeley, *are particular in their nature, but general in their repreſentation.*"

91 Which, though particular in themſelves, ſerve to demonſtrate general truths; becauſe

But if in univerſal propoſitions, ideas particular in themſelves be uſed only as the ſigns of others, it may be demanded, how we can know any propoſition to be true of all the ideas which are repreſented by the ſign? For example, having demonſtrated that the three angles of an iſoſceles rectangular triangle are equal to two right ones, how can we conclude that this affection therefore agrees to all other triangles which have neither a right angle nor two equal ſides? To this queſtion Biſhop Berkeley and Principal Campbell give the following anſwer: Though the idea we have in view whilſt we make the demonſtration be that of an iſoſceles rectangular triangle, whoſe ſides are of a determinate length, we may yet be certain that the demonſtration extends to all other rectilineal triangles of what ſort or bigneſs ſoever; for this plain reaſon, that neither the equality nor determinate length of the ſides, nor the right angle, are at all concerned in the demonſtration. It is true, the idea or diagram we have in view includes all theſe particulars; but then there is not the leaſt mention made of them in the

proof

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proof of the propofition. It is not faid the three angles are equal to two right angles, *becaufe* one of them is a *right angle*, or becaufe the fides comprehending it are of equal length; which fufficiently fhows that the right angle might have been oblique and the fides unequal; and for all that the demonftration have held good. In every one of Euclid's theorems, a particular triangle, and a particular parallelogram, and a particular circle, are employed as figns to denote all triangles, all parallelograms, and all circles. When a geometrician makes a diagram with chalk upon a board, and from it demonftrates the property of a ftraight-lined figure, no fpectator ever imagines that he is demonftrating a property of nothing elfe but that individual white figure, five inches long, which is before him.—Every one is fatisfied that he is demonftrating a property of all of that order, whether more or lefs extenfive, of which it is both an example and a fign; all the order being underftood to agree with it in certain characters, however different in other refpects. Nay, what is more, the mind with the utmoft facility extends or contracts the reprefentative power of the fign as the particular occafion requires. Thus the fame equilateral triangle will with equal propriety ferve for the demonftration, not only of a property of all equilateral triangles, but of a property of all ifofceles triangles, or even of a property of all triangles whatever. Nay, fo perfectly is this matter underftood, that if the demonftrator in any part fhould recur to fome property belonging to the particular figure he hath conftructed, but not effential to the kind mentioned in the propofition, and which the particular figure is folely intended to reprefent, every intelligent obferver would inftantly detect the fallacy: So entirely for all the purpofes of fcience doth a particular ferve for a whole fpecies or genus. Now, why one *vifible* individual fhould in our reafonings ferve without the fmalleft inconvenience as a fign for an infinite number, and yet one *conceivable* individual, or a particular idea of imagination, fhould not be adapted to anfwer the fame end, it will, we imagine, be utterly impoffible to fay (N).

It muft, however, be confeffed, that there is a confiderable difference in kind, between *ideas* ufed as figns and the *general* terms of any language. Amongft all the individuals of a fpecies, or even of the higheft genus, there is ftill a natural connection, as they agree in the fpecific or generic character; and when the mind makes ufe of any pofitive idea as the fign of the fpecies or genus, that idea appears in the imagination as an exact refemblance of fome one individual. But the connection which fubfifts between words and things, or even between words and ideas, is in its origin arbitrary; and yet its effect upon the mind is much the fame with that of the natural connection between ideas and things. For having often had occafion to obferve particular words ufed as figns of particular things, and fpecific terms ufed as figns of a whole fpecies, we contract a habit of affociating the fign with the thing fignified, infomuch that either being prefented to the mind neceffarily introduces or occafions the apprehenfion of the other. Cuftom in this inftance operates precifely in the fame manner as natural refemblance in the other; fo that certain founds, and the ideas of things to which they are not naturally related, come to be as thoroughly linked in our conceptions as the ideas of things and things themfelves. Nay, fo completely are they linked together, that we often ufe, through long chains of reafoning, certain founds or words, without attending at all to the ideas or notions of which they are figns. "I believe (fays the author of *A Treatife on Human Nature*), that every one who examines the fituation of his mind in reafoning will agree with me, that we do not annex diftinct and complete ideas to every term we make ufe of; and that in talking of *government*, *church*, *negotiation*, *conqueft*, we feldom fpread out in our minds all the fimple ideas of which the compound notions fignified by thefe terms are compofed. It is, however, obfervable, that notwithftanding this imperfection, we may avoid talking nonfenfe on thefe fubjects, and may perceive any repugnance among the ideas as well as if we had a full comprehenfion of them." This remark generally holds true; but then it is to be obferved, that all the words ufed as figns, and which yet do not denote any one conceivable determinate *idea*, muft be capable of definition. Thus, in matters that are perfectly familiar, in fimple narration, or in moral obfervations on the occurrences of life, a man of common underftanding may be deceived by fpecious falfehood, but is hardly to be gulled by downright nonfenfe or a repugnance of ideas. Almoft all the poffible applications of the terms (in other words, all the acquired relations of the figns) have become cuftomary to him. The confequence is, that an unufual application of any of them is inftantly detected; this detection breeds doubt, and this doubt occafions an immediate recourfe to *definition*; which, proceeding through fpecies and genera, refolves complex terms into others lefs complex, till it ends at laft in fimple ideas and relations, which can neither be defined nor mifunderftood (O). See LOGIC.

Thus

(N) Were it poffible to frame an *abftract general idea* of a triangle, which is neither equilateral, ifofceles, nor fcalenon, even *that idea* muft be ufed merely as a fign as much as any particular triangle whatever: and the queftion might ftill be afked, How we can know any propofition to be true of all the triangles reprefented by the fign? For example: having demonftrated that the three angles of an ideal triangle, which is neither equilateral, ifofceles, nor fcalenon, are equal to two right angles, how can we conclude that this affection agrees to triangles which are equilateral, &c.? To this queftion it is not eafy to conceive what anfwer could be given other than that of Berkeley and Campbell, in the cafe of ufing particular and conceivable triangles as figns.

(O) Since this article was written, fome excellent obfervations on the common doctrine concerning abftraction have been given to the public by profeffor Dugald Stewart of Edinburgh. See *Elements of the Philofophy of the Human Mind.*

Abſtraction and general ideas.

Thus then we ſee, that though there are no ideas, properly ſpeaking, general and abſtract, a man may by *terms* and *particular* ideas, uſed as *ſigns*, arrive at the knowledge of general truth. In neither caſe is it the

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It is not the matter but the power of the ſign that is regarded by the mind.

matter, if we may be allowed the expreſſion, but the *power* of the ſign, that is regarded by the mind. We find, that even in demonſtrative reaſonings, ſigns the moſt arbitrary, or mere ſymbols, may be uſed with as little danger of error as ideas or natural ſigns. The operations both of the algebraiſt and arithmetician are ſtrictly of the nature of demonſtration. The one employs as *ſigns* the letters of the alphabet, the other certain numerical characters. In neither of theſe arts is it neceſſary to form ideas of the quantities and ſums ſignified; in ſome inſtances it is even impoſſible without reſolving the quantity or ſum into parts, in a manner analogous to definition; and then the mind comprehends not the whole quantity or number at once, but the ſeveral parts of which it is compoſed, which it connects (P) by the relation of junction or addition. Yet without this reſolution, the equations and calculations carried on by means of the letters and figures ſignificant of the whole quantity or the whole ſum, are not the leſs accurate or convincing. And ſo much for *abſtraction*, *generalization*, and the power of *ſigns*, whether *natural* or artificial.

Chap. V. *Of the* Association *of* Ideas.

93
A continued train of thought in the mind.

Every man whilſt awake is conſcious of a continued train of thought ſpontaneouſly ariſing in his mind and paſſing through it; nor could a ſingle now or inſtant be pitched upon in which ſome idea is not preſent in his memory or imagination. No one idea, however, unleſs detained by a voluntary exertion of the mind, or unleſs productive of intenſe pleaſure or pain, remains long in the imagination; but each haſtens off the ſtage to make way for another, which takes its turn and is ſucceeded by a third, &c. We are not to imagine that this train of thought is altogether fortuitous and incoherent. "It is evident (ſays Mr Hume *), that there is a principle of connection between different thoughts or ideas of the mind; and that, in their appearance to the memory or imagination, they introduce each other with a certain degree of method and regularity. In our more ſerious thinking or diſcourſe this is ſo obſervable, that any particular thought which breaks in upon the regular tract or chain of ideas, is immediately remarked and rejected. Even in our wildeſt and moſt wandering reveries, nay, in our very dreams, we ſhall find, if we reflect, that the imagination ran not altogether at adventures, but that there was ſtill a connection upheld among the different ideas which ſucceeded each other. Were the looſeſt and freeſt converſation to be tranſcribed, there would immediately be obſerved ſomething which connected it in all its tranſitions: Or, where this is wanting, the perſon who broke the thread of diſcourſe might ſtill inform you, that there had ſecretly revolved in his mind a ſucceſſion of thoughts, which had gradually led him from the ſubject of converſation. Among different languages, even where we cannot ſuſpect the leaſt connection or communication, it is found, that words expreſſive of ideas the moſt compounded, do yet nearly correſpond to each other; a certain proof that the ſimple ideas comprehended in the compound ones, were bound together by ſome univerſal principle, which had an equal influence on all mankind."

* Eſſays.

Aſſociation of Ideas.

94
Principles of aſſociation.

That theſe obſervations are well founded, every man may be ſatisfied by looking attentively into his own thoughts; but when the author reduces the principles of this aſſociation of ideas to *three*, viz. *reſemblance*, *contiguity* in time and place, and *cauſe* or *effect*, he certainly contracts them within too narrow a compaſs. That theſe principles often ſerve to connect ideas, will not indeed be denied. A picture leads our thoughts to the original: the mention of one apartment in a building introduces an inquiry or diſcourſe concerning the others: and if we think of a wound, we can hardly forbear reflecting on the pain which follows it. But ſurely ideas ſometimes ſucceed each other without *reſemblance*, without *contiguity* in time or in place, and without being connected by the relation of a *cauſe* to its *effect*. Beſides all this, there are other aſſociations than of *ideas*. Ideas are aſſociated with paſſions and emotions, and paſſions and emotions are aſſociated together. A particular idea is aſſociated with a proper name, and often with the general name of the ſpecies. General conceptions, ſuch as thoſe which Mr Locke calls mixed modes (ſee Mode), are aſſociated with ſigns both audible and viſible, and ſigns are aſſociated with each other. Surely virtue, as it conſiſts in action and intention, does not reſemble the *ſound* virtue, is not *contiguous* to it in time or in place, and is neither its *cauſe* nor its *effect*; nor is it conceivable, that the arbitrary ſigns of different things ſhould have any natural relation to one another.

But were the enumeration complete, the bare mention of theſe principles does not account for the phenomena: For, granting the fact, it may ſtill be aſked, Why does a picture lead our thoughts to the original; or the mention of one apartment in a building introduce an inquiry concerning the others? To theſe queſtions our author has given no anſwer; nor are we acquainted with any writer who can be ſaid to have attempted it, except Dr Hartley and his ingenious editor. There may be ſome of our readers whom the names of theſe men will prejudice againſt their theory; but, doubtleſs, the greater part are willing to adopt truth, or to examine an ingenious ſpeculation, from whatever quarter it comes. To ſuch as feel themſelves otherwiſe diſpoſed, we beg leave to ſay, that if they allow the name of *Prieſtley* to diſguſt them at what follows, they will furniſh him with a new proof of the truth of the doctrine which they reject.

That

(P) No man, we think, will pretend that he can perceive at one view a million of individual men, or that he can imagine or conceive at once a million of ideal men: yet he may divide the million into parts, which in the one caſe may be eaſily viewed, and in the other may be eaſily conceived, in ſucceſſion. Thus, 100+100+100, &c.

Association of Ideas.

95 How they operate.

That *ideas* should be associated together, seems to be inevitable from the manner in which the mind acquires them. All our ideas, properly speaking, are of sensible objects, and by far the greater part of them of *visible* objects. But every sensible object conveys at once various sensations and perceptions to the mind, which appear not only united in fact, but inseparable in imagination. Thus, when a man looks at any particular object, a tree for instance, he perceives the *trunk*, *branches*, *leaves*, *size*, *shape*, and *colour*, &c. of the whole at *once:* he does not first perceive the *figure* of the trunk, then its *size*, then its *colour*, then the *branches*, &c. all in succession; but a perception of the *whole* is conveyed to the mind by one simultaneous impression (q.) We have already seen, that the senses, in fact, convey nothing to the mind but their respective sensations; and that the perception of the external object instantly follows the sensation. We have likewise seen, that sensation is occasioned by some impression, concussion, or vibration, given to the nerves and brain, and by them communicated to the mind or percipient being. We have likewise seen, that memory depends as much upon the brain as original sensation, and is always attended or occasioned by similar concussions or vibrations, &c. These are facts proved by universal experience, and which, we believe, no thinking man has ever called in question. It follows, therefore, that every actual sensation must leave some effect in the brain, either an actual print, which seems to be impossible, or a tendency to vibrate or be agitated in the same way as when the original impression was made. This being the case, it is natural to conclude, that when any part of the original perception is revived in the memory, the whole perception should be revived at once, so as that we cannot have an idea of the trunk of a tree without perceiving the ideas of the branches associated with it. This is indeed not merely natural, but the contrary seems to be impossible; for as the original agitation or vibration was occasioned by the whole tree, it is evident, that whatever effect or tendency that agitation or vibration left behind it, must be left by the whole vibration, and therefore be equally related to the whole tree.

But no object stands single in nature. When we view a tree, or any thing else, we always notice, however transiently, the field where it grows and the objects around it. These too leave effects in the brain at the same time that the tree does so; and therefore make their appearance with it in the memory or imagination: but if the tree was the object to which we principally attended during the actual sensation, the idea of it will be much more vivid than the idea of its adjuncts, and remain much longer in the imagination or memory; because the original sensation by which it was perceived, was struck much deeper than the sensations by which its adjuncts were perceived. All this must be intelligible to every one who attends to what we have already said of sensation, perception, and memory.

Thus we see why a picture leads our thoughts to the original, and why the mention of one apartment in a building introduces an inquiry concerning the others. It is not merely because the picture *resembles* the original, and because the apartments of a building are *contiguous*. Between a plain surface, variously coloured and shaded, and the contour of the human face, there is certainly very little real resemblance, as any man may be convinced who places his eye within six inches of a good picture. But the painter, having by his skill in perspective, contrived to lay his colours on the plain canvas in such a manner as that they reflect the same rays of light with the original; provided the spectator stand at the proper distance; these rays proceeding from the picture fall upon the eye in the same direction, and therefore give to the nerves and brain the very same impulse which was given by the original. When one apartment of a building is mentioned, we inquire concerning the others from the very same cause that, when we think of the trunk of a tree which we have seen, we cannot avoid thinking likewise of its branches.

96 Association gives meaning to words and language.

But the principle of association takes place among things not naturally connected, as the apartments of a building and a substance and its attributes and adjuncts. It is association which is the original source of all the general or complex conceptions which we have, and which even gives meaning to the words of every language. Between sounds considered in themselves, and things, or the ideas of things, every one knows that there is no natural connection; yet the idea of every known object is in the mind of every man so strictly associated with the name that it bears in his native tongue, that the presence of the one always suggests the other. It cannot indeed be otherwise, if we attend to the manner in which a child learns to affix a meaning to the words which he hears.—A child knows his mother and nurse, and indeed almost every visible object in the family, long before he acquires the power of articulation. The impressions made

(q.) This is certainly the case with adults, but it may be doubted whether it be so with very young children. It has been shown already, that the sensation communicated by the eye from any visible object, has not the least resemblance to that object; and that in looking at a tree or any thing else, a full grown man pays not the least attention to the appearance which the tree really makes to his eye; nay, that he is not even conscious of that appearance, farther than as it consists in colour. It is by the sense of touch only that we acquire ideas of figure, even of plain figure; and we imagine that we perceive them by the eye only, because different figures, as distinguishable by touch, are so closely associated with their corresponding visible sensations, that long before we are capable of inquiry, these two things are inseparable in the imagination. It is otherwise with children, who, when they first begin to distinguish objects by the sense of sight, appear to do it with great deliberation, as if they first felt the proper sensation of light and colours so or so modified, and afterwards acquired, by something like a mental inference, a notion of the figure at which they are looking.

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But we need not have recourse to children for the proof of our assertion. It is obvious that the name of every simple and uncompounded idea can be significant only by association. Of a complex conception the name may be made intelligible by a definition; but simple ideas cannot be defined, and between ideas and sounds there is no natural connection, so as that the one previous to association should suggest the other. Even of complex conceptions and mixed modes, the meaning of the names is generally acquired by association; for though it is certainly true, that all such names are capable of definition, they are yet used with sufficient propriety by thousands who know not what a definition is. Were a plain unlettered man asked to define virtue, it is not probable that he could do it so as to make himself understood; yet having ideas of the *practice of justice*, *charity*, *fortitude*, &c. strictly associated in his mind with the *word virtue*, he may know the general meaning of that word as well as the most acute grammarian or the most profound philosopher.

An *alms* is a donation to a poor man; but a child who never heard of this definition knows perfectly what an *alms* is, from having often seen his parents give money to a beggar, and call what they were doing by the name *alms*. The sound of the word, after having seen the first alms given, will excite in his mind an idea of the *individual* object who received it, and of the *action* of him by whom it was given; but after having seen several poor men relieved, he comes to associate with the word *alms* any thing given to any person who needs it or appears to be in want.

So completely does this association take place between ideas or clusters of ideas, and the words by which they are expressed, that even men of letters hear and understand perfectly many words without reviewing in their minds all the ideas and relations of which they are the signs. It has been already observed, that in talking of *government*, *church*, *negotiation*, *conquest*, we seldom spread out in our minds all the simple ideas of which the compound notions signified by these terms are composed; and we now add, that the terms may be used with sufficient propriety, and be perfectly understood by those who never attempted to analyse the notions of which they are significant into their primary and constituent parts. Every man has read numberless details of the transactions of one court with another; he has heard such transactions universally called by the term *negotiation*. The term and the transactions signified by it are so closely associated in his mind, that they are in a manner inseparable; and by this association he knows the meaning of the term better than he could have done by the most complete definition; which, perhaps, he would find it difficult to give, or even to comprehend.

97 and is the source of our first notions of virtue.

We have said that the *meaning* of the word *virtue* is acquired by association, by having often heard that sound applied to certain *actions*; but it is extremely probable, that the very *notion* of virtue, simple and uncompounded as it appears to be, is acquired in the very same manner. The *first* rudiments of the notions of *right* and *wrong* and *obligation* seem to be acquired by a child when he finds himself checked and controled by superior power. At first he feels nothing but mere *force*, and consequently has no notion of any kind of restraint but that of necessity. He finds he cannot have his will, and therefore he submits. Afterwards he attends to many circumstances which distinguish the commands of a *father*, or of a *master*, from those of any other person. Notions of *reverence*, *love*, *esteem*, and *dependence*, are connected with the idea of him who gives those commands; and by degrees the child experiences the peculiar *advantages* of filial subjection. He sees also that all his companions, who are noticed and admired by others, obey their parents; and that those who are of a refractory disposition are universally disliked. These and other circumstances now begin to alter and modify the notion of mere necessity, till by degrees he considers the commands of a parent as something that *must not* be resisted or disputed, even though he has a power of doing it; and all these ideas coalescing, form the notions of *moral right* and *moral obligation*, which are easily transferred from the commands of a parent to those of a magistrate, of God, and of conscience. This opinion of the gradual formation of the ideas of moral right and wrong, from a great variety of elements associated together, perfectly accounts for that prodigious diversity in the sentiments of mankind respecting the objects of moral obligation; nor do we see that any other hypothesis can account for the facts. If the notion of moral obligation were a simple uncompounded idea, arising from the view of certain actions or sentiments; or were it acquired, as it certainly might be, by a chain of reasoning from the nature of God and the nature of man; why should it not in the one case be as invariable as the perception of colours or sounds, and in the other as our judgements of mathematical or physical truths? But though the shape and colour of a flower appear the same to every human eye; though every man of common understanding knows, that if a billiard ball be struck by another, it will move from its place with a velocity proportioned to the force of the impulse; and though all mankind who have but dipt into mathematics, perceive that any two sides of a triangle must be greater than the third side; yet one man practises as a moral duty what another looks upon with abhorrence, and reflects on with remorse. Now a thing that varies with education and instruction, as moral sentiments are known to do, certainly has the appearance of being generated by a series of different impressions and associations in some such manner as we have endeavoured to describe. Let not any man imagine that this account of the origin of moral sentiments endangers the cause of virtue; for whether those

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those sentiments be instinctive or acquired, their operation is the very same, and in either case their rectitude must often be tried by the test of reason, so that the interests of virtue are equally safe on this as on any other scheme. See *Moral Philosophy*.

98 It ought, therefore, to be attended to in the education of youth.

This principle of association has so great an influence over all our actions, passions, reasonings, and judgments, that there is not perhaps any one thing which deserves more to be looked after in the education of youth. Some of our ideas—such as those of a substance and its attributes, a genus and the species contained under it, a species and its several individuals, have a real connection with each other in nature. These it is the office of our reason to trace out and to hold together in that union and order in which nature presents them to the view of the mind; for such associations constitute perhaps the greatest part of necessary and of useful truths. But there are others formed by custom and caprice, which are too often the sources of error, superstition, vice, and misery—of errors the more dangerous, and of vice the more deplorable; that if the associations have been long formed without an attempt to dissolve them, they generally become at last too strong to be broken by the most vigorous effort of the best disposed mind. Thus, let a foolish maid* amuse or rather frighten children with stories of ghosts appearing in the dark, let her repeat these fictions till they have made a deep impression on the young minds, and the notion of ghosts will in time become so closely associated with the idea of darkness, that the one shall always introduce the other; and it may not be in the power of the children, after they have become men, and are convinced in their judgments of the falsehood and absurdity of the tales which originally frightened them, to separate entirely the notion of ghosts from the idea of darkness, or with perfect ease to remain alone in a dark room. Again, let the idea of *infallibility* be annexed to any person or society, and let these two inseparably united constantly possess the mind; and then one body in ten thousand places at once shall, unexamined, be swallowed for an incontrovertible fact, whenever that infallible person or society dictates or demands assent without inquiry.

* *Locke's Essay*, and *his Conduct of the Understanding*.

Some such wrong and unnatural combinations of ideas will be found to establish the irreconcileable opposition that we find between different sects in philosophy and religion; for we cannot imagine every individual of any sect to impose wilfully on himself, and knowingly to reject truth offered by plain reason. That which leads men of sincerity and good sense blindfold, will be found, when inquired into, to be some early and wrong association. Ideas independent and of no alliance to one another, are by education, custom, and the constant din of their party, so linked together in their minds, that they can no more be separated from each other than if they were but one idea; and they operate upon the judgment as if they really were but one. This gives sense to jargon, the force of demonstration to absurdities, and consistency to nonsense: it is the foundation of the greatest and most dangerous errors in the world; for as far as it obtains, it hinders men from seeing and examining.

Before we dismiss the subject of association, it may be proper to inquire, how far it is agreeable to the account which we have given of the manner in which external objects are perceived by means of the senses, and the ideas of such objects retained in the memory.

99 The principle of association operates in perception of external objects.

—It has been proved, we think, by arguments unanswerable, that by the organs of sense nothing is conveyed immediately to the mind but sensations which can have no resemblance to external objects, and that the perception of an object may be resolved into a process of reasoning from effects to causes.—But children, it will be said, do not reason from effects to causes, and yet they soon acquire the faculty of perceiving and distinguishing the objects with which they are surrounded. This is an undoubted truth, and it can be accounted for only by the principle of association. A child has as much the use of his senses as a full grown man. By his eye he has the sensation of colour; by his nose, that of smell; by his ear he has the sensation of sound; and by his hand he feels heat and cold, resistance and bounded resistance. Every object which is presented to him, impresses his mind with various sensations: and these sensations combined together are probably all that he perceives for some years; for there is no reason to imagine that a boy of one or two years old has the slightest notion of what we mean by solidity, hardness, softness, or indeed of that which is termed *substance*. Yet when two or more objects are present, he may easily distinguish the one from the other, because the sensations excited by the one must differ from those excited by the other, as much as the real qualities of the one are different from the real qualities of the other; and by distinguishing between his own sensations, he in effect distinguishes between the objects which produce these sensations. His sensations too being frequently excited, leave behind them ideas in his memory or imagination; and those ideas, from having been imprinted together and never separated, become in time so closely associated, that whenever one of them is called into view, the others necessarily make their appearance with it. Thus a child has a set of combined sensations excited in his mind by the presence of his nurse; he has a different cluster excited, suppose, by the presence of his mother. These are often repeated, and leave deep traces behind them; so that when the mother or the nurse makes her appearance, she is immediately recognised as a known object; or, to speak more correctly, the child feels the very same sensations which he has felt before, from which he has experienced pleasure, and of which he has the ideas treasured up in his memory or imagination. A stranger, on the other hand, must affect him with a set of new sensations, and of course will be distinguished from a known object as accurately as if the child were possessed of the notions of solidity, substance, qualities, and distance. A man born blind, who knew not that such things as fire and snow had ever existed, would yet distinguish the one from the other the moment that he should be brought within their influence. He could not indeed apply their names properly, nor say which is the fire and which the snow, nor would he at first have any notion of either of them as a real, external, and distant object; but he would certainly distinguish his own sensations, the sensation of heat from that of cold. It is just so with a child: At first he perceives nothing but different sensations. These he

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can diſtinguiſh; and as they are cauſed by different objects, in diſtinguiſhing between the ſenſations he will appear to diſtinguiſh between the objects themſelves. In a ſhort time, however, he acquires, by the following proceſs, ſome inaccurate notions of diſtance. He looks, for inſtance, earneſtly in his nurſe's face, and at the ſame time touches her cheek perhaps by accident. He repeats this operation frequently, till the ſenſation communicated by his eye comes to be aſſociated with that of his touch, and with the extending of his arm; and being all treaſured up as aſſociated ideas in the memory, the ſight of his nurſe makes him ever afterwards ſtretch out his hands with a deſire to touch her. All this while there is not the ſlighteſt probability that the child has any notion of *ſubſtance* or *qualities*, or of any thing beyond his own *ſenſations*, and the means by which he has experienced, that ſenſations which are pleaſant may be obtained, and that ſuch as are painful may be avoided. The preciſe time at which a child begins to think of external things we cannot pretend to aſcertain; but we are perſuaded that it is later than many perſons imagine, and certainly not till he has made conſiderable progreſs in the exerciſe of reaſon. Prior to that period the things which men know to be bodies, are known to children only as ſenſations and ideas ſtrongly bound together by the tie of aſſociation.

100 Seems to diſtinguiſh memory from imagination;

But if aſſociation be of ſuch importance in the act of ſenſation, it is of ſtill greater in that of retention; for it ſeems to conſtitute the whole difference that there is between imagination and memory. By many of the ancients, as well as by ſome modern philoſophers, theſe two faculties ſeem to have been confounded with each other; but between them there is certainly a great difference, though they likewiſe reſemble each other in ſome reſpects. An idea of memory, conſidered by itſelf, makes the very ſame appearance to the intellect as an idea of imagination. We contemplate both as if they were actual, though faint and diſtant perceptions: but the one is attended with the conviction, that it is the idea of an object which has really been perceived at ſome period of paſt time; whilſt the other is attended with no conviction, except that the idea itſelf is actually preſent to the mind. Mr Hume has ſaid, that ideas of memory differ from thoſe of imagination only in being more vivid and diſtinct; but certainly this is not always the caſe. An idea of imagination has ſometimes been taken for a real perception, which an idea of memory can never be. The difference between theſe two kinds of ideas, we are perſuaded, ariſes chiefly, if not wholly, from aſſociation. Every idea of memory is aſſociated with many others, and thoſe again with others down to the very moment of the energy of remembrance; whereas ideas of imagination are either the voluntary creatures of the fancy at the moment of their appearance, in which caſe we ſhould call them conceptions; or they are ideas which we have actually received from ſenſation, but which, on account of ſome link being broken in the vaſt chain of aſſociation, we cannot refer to any real objects. What gives probability to this conjecture is, that ideas often appear in the mind which we know not whether to refer to the memory or imagination, nothing being more common than to hear a perſon ſay, I have in my head the idea of ſuch or ſuch an object; but whether I remember or only imagine the object, I am very uncertain. Afterwards, however, by turning the idea over and over in the mind, he finds other ideas make their appearance, till at laſt cluſters of them come into view, and aſſociate ſo cloſely with the principal idea, which was the object of doubt, as to convince the judgment that it is an idea of memory.

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101 and to be the ground of our belief of what we remember.

It has been aſked, Why we believe what we diſtinctly remember? and to that queſtion it has been ſuppoſed that no anſwer can be given. But it appears to us, that aſſociation is the ground of belief in this as it will be found to be in other inſtances; and that a man believes he waſhed his hands and face in the morning, becauſe the idea of that operation is ſo ſtrongly linked in his mind to the whole train of ideas which have ariſen in it through the day, that he cannot ſeparate the firſt from the laſt, that which was a ſenſation in the morning from the ſenſations which are preſent at the inſtant of remembrance. As thoſe ideas are aſſociated by nature, each muſt paſs in review in its proper order; ſo that in ſo ſhort a ſpace of time there is no danger, and hardly a poſſibility, of taking the firſt for the laſt, or the laſt for the firſt. Nay more, we will venture to hazard an opinion, that every paſt event of a man's life, which he diſtinctly remembers, is tied by the chain of aſſociation to his preſent perceptions. That this is poſſible is certain, ſince it is not difficult to conceive how it may be done. The principal events of a ſingle day may ſurely be ſo linked together as to be all diſtinctly reviewed in a cluſter of ideas on the morrow. Of theſe events ſome one or other muſt be the moſt important, which will therefore make its appearance as an idea more frequently than the reſt, and be more cloſely aſſociated with the events of next day. Some event of that day will, for the ſame reaſon, be more cloſely aſſociated with it than the others; and theſe two, dropping perhaps all the reſt of their original companions, will paſs on together to the third day, and ſo on through weeks and months and years. In the compaſs of a year, ſeveral things muſt occur to make deep impreſſions on the mind. Theſe will at firſt be aſſociated together by events of little importance, like the occurrences of a ſingle day. Whilſt theſe feeble chains, however, continue unbroken, they will be ſufficient to link the one important event to the other, and to bring them both into view at the ſame time, till at laſt theſe two, from appearing ſo often together, will in time unite of themſelves, and the intermediate ideas be completely effaced. Thus may two or three important events of one year be aſſociated with ſuch a number of ſimilar events of another year, ſo that the ideas of the one ſhall always introduce to the mind the ideas of the other; and this chain of aſſociation may paſs from the earlieſt event which we diſtinctly remember through all the intermediate years of our lives down to the inſtant when memory is exerted.

To this account of memory it may perhaps be objected, that it gives us no diſtinct notion of time. Every thing that is remembered is neceſſarily believed to have been preſent in ſome portion of paſt time; but aſſociation brings into view nothing but a ſeries of events. This objection will be ſeen to have no weight when we have inquired into the nature of time, and aſcertained what kind of a thing it is. It will

then

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then perhaps appear, that duration itself, as apprehended by us, is not distinguishable from a series of events; and that if there were no train of thought passing through our minds, nor any motion among the objects around us, time could have no existence. Meanwhile, whatever become of this opinion, we beg leave to observe, that our theory of remembrance is perfectly consistent with the commonly received notions respecting time; and indeed, that it is the only theory which can account for numberless phenomena respecting past duration. It is universally allowed, that if motion or a succession of events do not constitute time, it is the only thing by which time can be measured. Now it is a fact which no man will deny, that the distance of time from the present *now* or instant to the earliest period which he distinctly remembers, appears to his view extremely short, much shorter than it is said to be in reality; and that one year, when he looks forward, appears longer than two, perhaps longer than ten, when he looks backward. Upon our principles this fact is easily accounted for. We remember nothing which is not linked by a chain of associations with the perceptions of the present moment; and as none but a few of the most important events of our lives can be linked together in this manner, it hence follows, that events which, in the order of succession, were far *distant* from each other, must thus be brought *together* in the memory, and the whole chain be contracted within very short limits. But when we figure to ourselves a series of future events, we employ the active power of fancy instead of the passive capacity of retention; and can therefore bring within the compass of one periodical revolution of the sun a longer series of imaginary events succeeding each other, than is preserved of real events in our memory from the earliest period of our existence. So perfectly does our theory accord with this well-known fact. On the other hand, if memory be an original faculty of the mind totally independent of association, and of which no other account is to be given than that it necessarily commands our belief, why is it a faculty which, with regard to duration, thus uniformly deceives us? and how comes it to pass, that to a man whose memory is tenacious, who has read much, seen many countries, and been engaged in various occurrences, any determinate portion of past time always appears longer than to another man whose memory is feeble, and whose life has been wasted in ease and idleness? To these questions we know not what answer can be given upon any other principle than that which makes the evidence of memory depend upon association. But if we remember nothing but what is linked to the perception or idea which is present with us at the time of remembrance, and if duration be measured by the succession of events, it is obvious that any portion of past time must necessarily appear longer to him who has many ideas associated in his mind than to him who has but few.

102 The importance of association in the philosophy of the human mind.

There is not perhaps a single fact of greater importance in the philosophy of the human mind than the *association of ideas*; which, when thoroughly understood, accounts for many of those phenomena which some late writers of name have, with injury to science and with danger to morality, attributed to a number of distinct and independent instincts. It is for this reason that we have considered it so minutely, and dwelt upon it so long; and in addition to what we have said on the subject, we beg leave to recommend to our more philosophical readers the diligent study of Hartley's Observations on Man (R). In that work we think several things are taken for granted which require proof; and some which, we are persuaded, have no foundation in nature: but, with all its defects, it has more merit than any other treatise on the sensitive part of human nature with which we are acquainted.

Chap. VI. *Of* Consciousness *and* Reflection.

103 Consciousness, what it is, and what are its objects.

Sensation, remembrance, simple apprehension, and conception, with every other actual energy or passion of the mind, is accompanied with an inward feeling or perception of that energy or passion; and that feeling or perception is termed *consciousness*. *Consciousness* is the perception of what passes in a man's own mind at the *instant* of its passing there; nor can we *see*, *hear*, *taste*, *smell*, *remember*, *apprehend*, *conceive*, employ our faculties in any manner, enjoy any pleasure, or suffer any pain, without being *conscious* of what we are doing, enjoying, or suffering. *Consciousness* is only of things *present* *; and to apply it to things *past*, is to confound *consciousness* with memory or *reflection*. One cannot say that he is conscious of what he has seen or heard and now remembers: he is only conscious of the act of remembrance; which, though it respects a past event, is itself a present energy. It is likewise to be observed, that consciousness is only of things in the mind or conscious being, and not of things external. It is improper in any person to say that he is *conscious* of the table before him: he perceives it, he *sees* it; and he may with great propriety say that he is *conscious* he perceives or sees it; but he cannot say that he is conscious of the table itself, for it is only his immediate energy of perception that can be the object of consciousness. All the operations of our minds are attended with consciousness; which is the only evidence that we have or can have of their existence. Should a man take it into his head to think or to say that his consciousness may deceive him, and to require a proof that it cannot, we know of no proof that can be given him: he must be left to himself as a man that denies first principles, without which there can be no reasoning. Every attempt to prove this point, or to set it in a clearer light, would only serve to render it more dark and unintelligible. I *think*, I *feel*, I *exist*, are first truths, and the basis of all human knowledge.

* *Reid's Essays on the Intellect. Powers of Man.*

104 Des Cartes's argument from consciousness for his own existence.

This has given rise to the question, whether Des Cartes did not fall into an absurdity when, inferring his own existence from his actual thought, he said, *Cogito, ergo sum?* This argument has been called a pitiful sophism, and a *petitio principii*; because, before a man

(R) Since this was written Mr Stewart's *Elements of the Philosophy of the Human Mind* have been published; in which the reader will find many excellent remarks on the nature and influence of the associating principle.

Of Conſciouſneſs and Reflection.

man take it for granted that he thinks, he muſt alſo, it is ſaid, take it for granted that he exiſts, ſince there cannot be thought where there is no exiſtence. Now it muſt be confeſſed, that if Des Cartes pretended by this argument to give us a freſh conviction of our own exiſtence, his endeavours were uſeleſs and puerile; becauſe a man capable of being convinced by the arguments of another, muſt have a previous conviction of his own exiſtence: but the argument itſelf is certainly neither a ſophiſm nor a *petitio principii*. Thoſe*, who defend Des Cartes aſſert, and there is no reaſon to doubt the truth of their aſſertion, that his only view in urging ſuch an argument was not to prove the truth of our exiſtence, but to exhibit the order of that proceſs by which we arrive at the knowledge of the fact; and this he has very clearly done by analyſing the truth into its firſt principles. A ſtone exiſts as well as the human mind; but has the ſtone any knowledge of its own exiſtence? No man will ſay that it has; neither ſhould we have any knowledge of ours, did we think as little as the ſtone. We certainly *might* exiſt without thinking, as it is probable we do in very ſound ſleep; and in that ſtate our exiſtence might be known to other beings, but it could not poſſibly be known to ourſelves: for the only things of which the mind is conſcious, or has immediate knowledge, are its own operations. I *exiſt* is therefore a legitimate inference from the propoſition I *think*; and the obſervation that it is ſo may be uſeful to ſhow us the procedure of the mind in the acquiſition of knowledge; but it has little merit as an argument, and ſtill leſs as a diſcovery, though, being ſtrictly true and juſt, it ſhould never have been expoſed to ridicule.

* See Buffier's Firſt Truths.

105 *Reflection, what it is, how different from conſciouſneſs.*

It is to be obſerved, that we are conſcious of many things to which we give very little attention. We can hardly attend to ſeveral things at the ſame time; and our attention is commonly employed about that which is the *object* of our thought, and rarely about the thought itſelf. It is in our power, however, when we come to the years of underſtanding, to give attention to our own thoughts and paſſions, and the various operations of our minds. And when we make theſe the objects of our attention, either while they are preſent, or when they are recent and freſh in our memory, we perform an act of the mind which is properly called *reflection*. This *reflection* ought to be diſtinguiſhed from *conſciouſneſs* *, with which it is confounded ſometimes by Locke, and often by the learned author of Ancient Metaphyſics. All men are *conſcious* of the operations of their own minds at all times while they are awake, nor does it appear that brutes can be wholly deſtitute of conſciouſneſs; but there are few men who *reflect* upon the operations of their minds, or make them the objects of thought; and it is not probable that any ſpecies of brutes do ſo.

* [illegible]

From infancy, till we come to the years of underſtanding, we are employed ſolely about ſenſible objects. And although the mind is conſcious of its operations, it does not attend to them; its attention is turned ſolely to the objects about which theſe operations are employed. Thus, when a man is angry, he is *conſcious* of his paſſion; but his *attention* is turned to the *perſon* who offended him and the *circumſtances* of the *offence*, while the *paſſion of anger* is not in the leaſt the object of his attention. The difference between *conſciouſneſs* and *reflexion*, is like the difference between a ſuperficial view of an object which preſents itſelf to the eye while we are engaged about ſomething elſe, and that attentive examination which we give to an object when we are wholly employed in ſurveying it. It is by conſciouſneſs that we immediately acquire all the knowledge which we have of mental operations; but attentive reflexion is neceſſary to make that knowledge accurate and diſtinct. *Attention* is a voluntary act; it requires ſome exertion to begin and continue it; and by great exertion it may be continued for a conſiderable time; but *conſciouſneſs* is involuntary, and of no continuance, changing with every thought. The power of reflexion upon the operations of their own minds does not at all appear in children. Men muſt have come to ſome ripeneſs of underſtanding before they are capable of it. Of all the powers of the human mind it ſeems to be the laſt that unfolds itſelf. Moſt men ſeem incapable of acquiring it in any conſiderable degree; and many circumſtances conſpire to make it to all men an exerciſe of difficulty. The difficulty, however, muſt be conquered, or no progreſs can be made in the ſcience of our own or of other minds.

106 *All our notions of mental energies got by reflection.*

All the notions which we have of mind and of its operations are got by reflection; and theſe notions are by Mr Locke called *ideas of reflection*. This term we think extremely ill choſen; and we believe it has been the ſource of much error and confuſion among Locke's followers. A man, by attending to the operations of his own mind, may have as diſtinct *notions* of remembrance, of judgment, of will, of deſire, as of any object whatever: but if the ſecondary perception of a ſenſible object, that appearance which it has to the mind when viewed in the memory or imagination, be properly called an *idea*, it is certain that of the operations of the mind itſelf there can be no ideas; for theſe operations, when reflected on, make no appearance without their objects either in the memory or in the imagination. Nothing is more evident, in fact, than that we have no *ideas*, in the original and proper meaning of the word, but of ſenſible objects, upon which the mind exerts its firſt operations. Of theſe operations we have indeed a conſciouſneſs; but abſtracted from their objects we cannot frame of them any idea or reſemblance. We are *conſcious* to ourſelves of *thinking*, *willing*, *remembering*, *diſcerning*, *reaſoning*, *judging*, &c. but let any one look into himſelf, and try whether he can there find any *idea* of *thinking* or *willing*, &c. entirely ſeparate and abſtracted from the *object* of thought or will. Every man who has ſeen a tree or a houſe, will find in his mind ideas of theſe objects, which he can contemplate by themſelves, independent of every thing elſe; but no man can contemplate the *idea* of thinking or deſiring without taking into view the thing thought on or deſired. It is plain, therefore, that the energies of *thinking*, *willing*, and *deſiring*, with all their various modifications, are not themſelves *ideas*, or capable of *communicating* ideas to be apprehended, as the ideas of bodies are apprehended by the pure intellect. They are the *actions* and *workings* of the *intellect itſelf* upon ideas which we receive from the objects of ſenſe, and which are treaſured up in the memory or imagination for the very purpoſe of furniſhing the intellect with materials to

work

work upon. Between *ideas* and the *energies of thinking* there is as great and as obvious a difference as there is between a *stone* and the *energies* of him by whom it is cast. Ideas are the passive subjects; the energies of thinking are the operations of the agents. Ideas are relicts of sensation, and have a necessary relation to things external; the energies of thinking are relicts of nothing, and they are wholly and originally internal.

107 Our knowledge of the operations of intellect immediate, and not by the intervention of *ideas*.

That we can in no sense of the word be said to have *ideas* of the operations of the intellect, will be still more evident if we consider by what means we acquire the knowledge which we have of those operations. It has been already observed, that when our thoughts are employed upon any subject, though we are conscious of thinking, yet our *attention* is commonly employed upon the *object* of our thought, and not upon the *thought* itself: and that if we would give attention to our thoughts and passions, we must do it by a reflex act of the mind, whilst the act of thinking is still recent and fresh in our memory. Thus, if a man wishes to know what perception is, it is not the time to make the inquiry while he is looking at some rare or beautiful object; for though he is *conscious* of the energy of perceiving, the *object* of perception employs all his *attention*. But the time to make this inquiry is either when the object has become familiar to him, or presently after it is removed from his sight. In the former case, he can look upon it without emotion, pay attention to every step in the process of perception, and be immediately conscious what perception is. In the latter case, by turning his attention inwards, and reflecting on what he did or felt when the object was before him, he will find clear and vivid ideas of every thing which he perceived by his sense of sight; but he will find no *idea* of the act of *seeing* or *perceiving*. On the contrary, if he be capable of sufficient attention, he will observe that his intellect is employed in the very same manner upon the *ideas* that it was upon the original *sensations;* and of that employment, and the manner of it, he will be equally conscious as he was of the original energy exerted in sensation. There is indeed this difference between the two, without which reflection could make no discoveries, that the most vivid ideas being still faint when compared with actual sensations, the intellect is not so wholly engrossed by them as it was by the original objects, nor is it so rapidly carried from idea to idea as it was from sensation to sensation. It is thus at leisure to attend to its own operations, and to know what they are; though to form *ideas* of them as separate from their objects, is absolutely impossible. Every man capable of paying attention to what passes within himself when he sees, hears, and feels, &c. may have very accurate *notions* of *seeing*, *hearing*, and *feeling*, &c. but he cannot have *ideas* of them as he has of the *objects* of *sight*, *hearing*, and *touch*.

The same is the case with respect to the exertion of our reasoning faculties. A man must have distinct and clear *ideas* to reason upon, but he can have no *idea* of reasoning itself, though he must be conscious of it, and by attention may know what it is. When a man sits down to study for the *first time* a proposition in the Elements of Euclid, he certainly employs his reasoning faculty, and is conscious that he is doing so; but his attention is wholly turned to the diagram before him, and to the several ideas which the diagram suggests. Afterwards, when he has mastered the proposition, he may go over it again, with a view to discover what reasoning is; but he will not find he has any *idea* of reasoning as he has of the diagram. He will only exert that faculty a second time, and perceive one truth linked to and depending upon another in such a manner that the whole taken together forms a complete demonstration. In a word, the operations of our own minds, when attention is paid to them, are known immediately by consciousness; and it is as impossible that we should have ideas of them, as that a living man should be a picture upon canvas. He who attends to what passes in his own mind when he perceives, remembers, reasons, or wills, must know by consciousness what these operations are, and be capable of forming very accurate notions of them, as connected with their objects; and he who does not attend to what passes in his own mind will never acquire any notions of them, though he were to read all that has been written on the subject from the days of Pythagoras to those of Dr Reid.

As we acquire ideas of external objects by means of our senses; and notions of perceiving, remembering, reasoning, and willing, &c. by reflecting on the operations of our own minds; so are there other things of which we acquire notions, partly by sensation, partly by reflection, and partly by means of that faculty of which it is the more peculiar office to compare ideas and to perceive truth. Such are *substance*, *body*, *mind*, with their several qualities, adjuncts, and relations; the knowledge of which, as has been already observed, constitutes what in strictness of speech is termed the science of *metaphysics*. These shall be considered in order, after we have investigated the nature of truth, and inquired into the several sources of evidence; but there is one notion, about the origin and reality of which there have been so many disputes, which in itself is of so great importance, and which will be so intimately connected with all our subsequent inquiries, that it may not be improper to consider it here.—The notion to which we allude is of POWER.

108 There are things which we know partly by sensation and partly by reflection, &c.

109 Our notion of power how acquired.

Among the objects around us we perceive frequent changes, and one event regularly succeeding another. Gold thrown into the fire is changed from a fixed to a fluid body. Water exposed to a certain degree of cold is changed from a fluid to a fixed body. Night succeeds to day, and summer succeeds to winter. We are conscious of new sensations in ourselves every hour. We are likewise conscious of reasoning, willing, and desiring; and we know that by an exertion of will we can rise or sit, stand still or walk, call one idea into view, and dismiss others from our contemplation. Experience teaches us, that it is not occasionally, but always, that gold is changed into a fluid by being thrown into the fire, and water into a fixed body by being exposed to a certain degree of cold; that night succeeds to day, and summer to winter. These changes have regularly taken place since the creation of the world; and it has never once been observed that water was fixed by fire, or gold rendered liquid by cold. Were we not assured by experience that our own voluntary motions are produced by exertions of our minds, of which we are conscious, and that without such

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such exertions those motions would never have taken place, we should probably have considered the liquifaction of gold as an event equally independent of fire, though uniformly conjoined with it, as night is independent of day, and day of night. But having experienced that we can move or not move our bodies as we please; that when it is our will to sit, we never get up to walk; and that when we wish to walk, we always do it except prevented by external violence; having likewise experienced, that by a thought, by some internal and inexplicable exertion of our minds, we can call up in our memory or imagination one idea and dismiss others from our mental view; we are led to believe with the fullest conviction, that all those motions of our bodies which in common language are termed *voluntary*, and that succession of ideas which follows a conscious exertion of the mind, depend upon ourselves. In other words, we are necessitated to believe that we have a *power* to move or not move our bodies in many cases, and a *power* to turn our attention to one idea in preference to others.

It is thus that we acquire the notion of *power* in ourselves, which we easily transfer to other objects. Knowing that the various motions of our bodies thus effected proceed from power, we are naturally led to inquire whether the changes which we perceive in other bodies may not proceed from *power* likewise, *i. e.* from something analogous to that power, of the exertions of which we are conscious in ourselves. Now uniform experience teaching us that gold is liquified by being thrown into the fire, and that water is fixed by being exposed to cold; we infer with the utmost certainty that there are *powers* in fire and cold to produce these changes, and that without the exertion of such *powers* these changes would not be produced. We cannot indeed say of external powers, as we can of our own, in what substance they inhere. We know with the utmost certainty that the voluntary motions of our hands, &c. are produced by a power not inherent in the hands but in the mind, for of the exertion of that power we are conscious; but we do not know whether the power which liquifies gold be inherent in that sensible object which we call *fire*, or in something else to which fire is only an instrument. We learn by observation, that the minute particles of fire or heat insinuate themselves between the particles of gold, and, if we may use the expression, tear them asunder; but whether they do this in consequence of a *power* inherent in themselves, or only as instruments impelled by another *power*, is a question which *observation* cannot enable us to answer.

Were we not conscious of the exertion of our own powers, it seems not conceivable that we could ever have acquired any notion of power at all; for power is not an object of sense, nor, independent of its operations, is it indeed an object of consciousness. In external operations, all that we perceive is *one thing*, in which we suppose the *power* to reside, followed by another, which is either the *change* or that on which the change is *produced*; but the exertion of the power itself we do not perceive. Thus we perceive gold, after it has been some time in the fire, converted from a fixed to a fluid body; but we perceive not by our senses either the power or the energy of the power which operates to this conversion. In the exercise of our own powers, the case is otherwise. When a man puts his hand to his head, and afterwards thrusts it into his bosom, he not only perceives by his senses the change of position, but is also conscious of the energy or exertion by which the change was produced.

"Suppose (says Mr Hume †) a person, though endowed with the strongest faculties of reason and reflection, to be brought on a sudden into this world; he would indeed immediately observe a continual succession of objects, and one event following another, but he would not be able to discover any thing farther. He would not at first by any reasoning be able to reach the idea of cause and effect; since the particular powers by which all natural operations are performed never appear to the senses. The impulse of one billiard ball is attended with motion in the second. This is the whole that appears to the *outward* senses. The mind feels no sentiment or *inward* impression from this succession of objects; consequently there is not, in any single particular instance of cause and effect, any thing which can suggest the idea of power or necessary connection. From the first appearance of an object, we never can conjecture what effect will result from it: but, were the power or energy of any cause discoverable by the mind, we could foresee the effect even without experience; and might at first pronounce with certainty concerning it by the mere dint of thought and reasoning. It is impossible, therefore, that the idea of power can be derived from the contemplation of bodies in single instances of their operations; because no bodies ever discover any power which can be the original of this idea."

† *Essays.*

There is a sense in which this reasoning is unquestionably just. A man who had never been conscious of exerting power in himself, would certainly not acquire the notion of power from observing a continual succession of external objects. The impulse of one billiard ball being followed by the motion of another, would no more lead him to the notion of power in the former, than the succession of night to day would lead him to the notion of a power in light to produce darkness. When Mr Hume says, "that from the *first* appearance of an object *we* can never conjecture what effect will result from it," he uses language that is ambiguous, and utters an assertion which is either true or false according to the sense in which it is understood. If it be meant, that after having reflected on the operations of our own minds, and learned by experience that motion is communicated by impulse from one ball of ivory to another, we could not conjecture whether a similar effect would be produced by the impulse of balls made of other hard bodies which we had never before seen, the assertion is manifestly false. A man who had but once seen motion communicated in this manner from one *ivory* ball to another, would certainly conjecture that it might be communicated from one *wooden* ball to another; and if he had seen it repeatedly communicated from one ball to another of different substances, he would infer, with the utmost confidence, that it might be communicated from ball to ball of whatever substance composed, provided that substance be hard, or of a similar texture with the balls to the impulse of which he had formerly paid attention.

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attention. If by this ambiguous phraſe the author only means, as is probably the caſe, that from the firſt appearance of an object to which we had never before obſerved any thing in any reſpect ſimilar, we could not conjecture what effect would reſult from it; or if his meaning be, that a man ſuddenly brought into the world, who had never acquired ſuch a notion of power as may be had from attention to the energies and operations of our own minds, would not, by obſerving an effect to reſult from one body, conjecture from the firſt appearance of another ſimilar body what effect would reſult from it; in either of theſe caſes his aſſertion is certainly true, and tends to prove, that without the conſciouſneſs of the operations of our own minds we could never acquire a notion of power from the changes perceived by our ſenſes in external objects.

110
Mr Hume attempts to prove that we can have no notion whatever of power.

But Mr Hume, not contented with denying, which he might juſtly do, that we could ever have derived the idea of power merely from obſerving the continual ſucceſſion of external objects, labours hard to prove that we have no notion of power at all, and that when we uſe the word *power*, we do nothing more than utter an inſignificant ſound. To pave the way for the arguments by which ſo extravagant a paradox is to be ſupported, he lays it down as a "propoſition which will not admit of much diſpute, that all our ideas are nothing but copies of our impreſſions; or, in other words, that it is impoſſible for us to *think* of any thing that we have not antecedently *felt* either by our external or internal ſenſes." As this propoſition, however, will admit, it ſeems, of *ſome* diſpute, he takes care, before he applies it to the purpoſe of demoliſhing all power, to ſupport it by two arguments. "Firſt (ſays he), when we analyſe our thoughts or ideas, however compounded or ſublime, we always find that they reſolve themſelves into ſuch ſimple ideas as were copied from a precedent feeling or ſentiment. Thoſe who would aſſert, that this poſition is not univerſally true nor without exception, have only one, and that an eaſy, method of refuting it; by producing that idea, which, in their opinion, is not derived from this ſource. Secondly, If it happen, from a defect of the organ, that a man is not ſuſceptible of any ſpecies of ſenſation, we always find that he is as little ſuſceptible of the correſpondent ideas. A blind man can form no notion of colours, a deaf man of ſounds. And tho' there are few or no inſtances of a like deficiency in the mind, where a perſon has never felt, or is wholly incapable of a ſentiment or paſſion that belongs to his ſpecies; yet we find the ſame obſervation to take place in a leſs degree. A man of mild manners can form no idea of inveterate revenge or cruelty; nor can a ſelfiſh heart eaſily conceive the heights of friendſhip and generoſity."

111
His reaſoning ſophiſtical.

As theſe propoſitions are the engines by which all power is baniſhed from the world, it may not be improper, before we proceed to inquire by what means they perform ſo arduous a taſk, to conſider their own inherent ſtrength; for if they be weak in themſelves, their work, however dexterouſly they may be employed, can have no ſtability. We have already noticed the perverſeneſs of this writer's language, when it confounds *ſenſations* with *impreſſions*; but here it is ſtill more perverſe, for paſſions, ſentiments, and even *conſciouſneſs*, are ſtyled *impreſſions*. When ſenſations are confounded with impreſſions, the effect is only miſtaken for the cauſe, it being univerſally known that ſenſations proceed from impreſſions made upon the organs of ſenſe. When conſciouſneſs is confounded with an impreſſion, one thing is miſtaken for another, to which it is univerſally known to have neither reſemblance nor relation. But, not to waſte time upon theſe fallacies, which, though dangerous if admitted, are yet too palpable to impoſe upon a reader capable of the ſlighteſt attention, let us examine the propoſitions themſelves. The moſt important, and that for the ſake of which alone the others are brought forward, is, that it is impoſſible for us to *think* of any thing that we have not immediately *felt*, either by our external or internal ſenſes." Did Mr Hume then never *think* of a mathematical *point*, or a mathematical *line*? Neither of theſe things is capable of being *felt* either by making an impreſſion upon the organs of ſenſe or as an object of conſciouſneſs; and therefore it is impoſſible that he ſhould ever have had ideas of them ſuch as he doubtleſs had of ſenſible objects; yet in the moſt proper ſenſe of the word *think* (s), he certainly thought of both points and lines; for he appears to have made conſiderable progreſs in the ſcience of geometry, in which he could not have proceeded a ſingle ſtep without a perfect knowledge of theſe things, on which the whole ſcience is built. It is not therefore true, that our thoughts or ideas, when analyſed, always reſolve themſelves into ſuch ſimple ideas as were copied from a precedent feeling or ſentiment; for every mathematical figure of which we can think reſolves itſelf into a point and motion; and a point having no parts and no magnitude, cannot poſſibly be the object of feeling to any of our ſenſes. If, therefore, ideas alone be the objects of thought, we have refuted Mr Hume's poſition by the very method which he himſelf lays down; for we have produced an idea which is not derived either from a precedent feeling or a precedent ſentiment. By ſentiment, we ſuppoſe to be here meant that which by other philoſophers is denominated conſciouſneſs; and of conſciouſneſs it is undeniable that nothing is the object but the actual energies of our own minds.

112
Things which we can have no ideas may themſelves be the objects of thought.

But ideas are not the only objects of thought. We have already given our reaſons for reſtricting the word *idea* to that appearance which an object of ſenſe, when reflected on, makes either in the memory or imagination. Such was undoubtedly its original ſignification; and had it never been uſed to denote other and very different objects, much error and perplexity would have been avoided, which now diſgrace the ſcience of metaphyſics. Things may *themſelves* be the objects of thought; and

(s) *Thinking*, in the propriety of the Engliſh tongue, ſignifies that ſort of operation of the mind about its ideas wherein the mind is active; where it, with ſome degree of voluntary attention, conſiders any thing. *Locke*.

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and when that is the caſe, to think of their *ideas*, were it poſſible to do ſo, would be worſe than uſeleſs; for we may certainly know a man better by looking at himſelf than by looking at his picture. Of things which are *themſelves* the objects of thought, we have either a *direct* or a *relative* knowledge. We know directly the actual operations of our own minds by the moſt complete of all evidence, that of conſciouſneſs; and we have a *relative* notion of mathematical points and lines: but neither of mental energies nor of theſe external things (T) can we poſſibly have any *idea*.

113 We have only relative notions of some things,

It is well obſerved by Dr Reid †, that our notions both of body and mind are nothing more than relative. "What is body? It is, ſay philoſophers, that which is extended, ſolid, and diviſible. Says the querist, I do not aſk what the properties of body are, but what is the thing itſelf? let me firſt know directly what body is, and then conſider its properties. To this demand I am afraid the querist will meet with no ſatisfactory anſwer; becauſe our notion of body is not direct, but relative to its qualities. We know that it is ſomething extended, ſolid, and diviſible, and we know no more. Again, if it ſhould be aſked, what is mind? It is that which thinks. I aſk not what it does, or what its properties are, but what it is? To this I can find no anſwer; our notion of mind being not direct, but relative to its operations, as our notion of body is relative to its qualities (U)."

† Eſſays on the Active Powers of Man.

114 But which, however, we can reason with utmost preciſion:

Our notion of a mathematical point is of the very ſame kind. What is a point? It is, ſays Euclid, that which hath no parts and no magnitude. Replies the queriſt, I aſk not either what it has or what it has not let me firſt know what it is? To this ſecond queſtion, it might perhaps be anſwered, that a mathematical point is that which by motion generates a line. But, rejoins the queriſt, I am not inquiring what it generates; give me a direct idea of the point itſelf? or, if that cannot be done, as ſurely it cannot, tell me what its offspring a line is? A line, ſays Euclid, is length without breadth. I have no idea, replies the queriſt, of length without breadth. I never felt an *impreſſion* from a ſenſible object which did not ſuggeſt length, breadth, and thickneſs, as inſeparably united; and I can have no idea which is not the *copy* of a *former impreſſion*. To aſſiſt the queriſt's conception, it may be ſaid that lines are the boundaries of a ſuperficies, and that ſuperficies are the boundaries of a ſolid body; but of a ſolid body every man has a clear and direct idea, in the moſt proper ſenſe of the word. Here then are ſeveral things, viz. points, lines, and ſuperficies, of not one of which is it poſſible to form a direct notion; and yet we know them ſo thoroughly, from the relation which they bear to other objects, that we can reaſon about them with a preciſion and certainty which only the mathematical ſciences admit.

115 And ſuch is power.

The great advantage of theſe ſciences above the moral, Mr Hume himſelf expreſsly admits: but he attributes it to a wrong cauſe, when he ſays it conſiſts in this, that the "ideas of the former being *ſenſible* are always clear and determinate;" for we ſee that the notion of a point or of a line is merely relative, and cannot poſſibly be the copy of a ſenſation, or, in his language, of a ſenſible impreſſion. If then we have clear and determinate notions of points and lines, and may reaſon about them without ambiguity, as he acknowledges we may, what is there to hinder us from having an equally clear and determinate notion of power, or from reaſoning about it with as little ambiguity (V)? Why, ſays he, we are not conſcious of power. And to prove this poſition, which needs no proof, he makes

(T) By calling mathematical points and lines external things, we do not mean to attribute to them any corporeal exiſtence. We know well that they are merely creatures of the mind, and that if there were no mind, they could have no exiſtence. But twenty men may at the ſame inſtant have a notion of the ſame lines and the ſame points; and therefore theſe lines and points have an exiſtence independent of, and external to, any *one* mind, at leaſt to any one *human* mind. The objects, however, of which a man is conſcious, are in no ſenſe whatever external, for they are preſent to no human mind but his own.

(U) The opinions of philoſophers concerning corporeal and ſpiritual ſubſtances ſhall be conſidered more fully hereafter. In quoting from Dr Reid on another ſubject, we have been obliged to anticipate his opinion, which will be found to be not more modeſt than juſt.

(V) "There are ſome things of which we can have both a direct and relative conception. I can directly conceive ten thouſand men, or ten thouſand pounds, becauſe both are objects of ſenſe, and may be ſeen. But whether I ſee ſuch an object, or directly conceive it, my notion of it is indiſtinct; it is only that of a great multitude of men, or of a great heap of money; and a ſmall addition or diminution makes no perceptible change in the notion I form in this way. But I can form a relative notion of the ſame number of men or of pounds by attending to the relations which this number has to other numbers greater or leſs. Then I perceive that the relative notion is diſtinct and ſcientific; for the addition of a ſingle man, or a ſingle pound, or even of a penny, is eaſily perceived. In like manner, I can form a direct notion of a polygon of a thouſand equal ſides and equal angles. This direct notion cannot be more diſtinct when conceived in the mind, than that which I get by ſight when the object is before me; and I find it ſo indiſtinct that it has the ſame appearance to my eye, or to my *direct* conception, as a polygon of a thouſand and one, or of nine hundred and ninety-nine ſides. But when I form a *relative* conception of it, by attending to the relation it bears to polygons of a greater or leſs number of ſides, my notion of it becomes diſtinct and ſcientific, and I can demonſtrate the properties by which it is diſtinguiſhed from all other polygons. From theſe inſtances it appears, that our relative conceptions of things are not always leſs diſtinct, nor leſs fit materials for accurate reaſoning, than thoſe that are direct; and that the contrary may happen in a remarkable degree."

Reid's Eſſays on the Active Powers of Man.

Of Consciousness and Reflection.

makes many observations that, however just, might certainly have been spared. Of these one is, that "a man suddenly struck with a palsy in the leg or arm, or who had now lost these members, frequently endeavours at first to move them, and employ them in their usual offices. Here he is as much conscious of power to command such limbs, as a man in perfect health is conscious of power to actuate any member which remains in its natural state and condition. But consciousness never deceives. Consequently, neither in the one case nor in the other are we ever conscious of any power." This is true; we never are conscious of any power; but we are frequently conscious of actual energies: and the man who, after being suddenly struck with a palsy, endeavours in vain to move his leg or arm, is as conscious of energy as he who in health makes the attempt with success. Nor let it be imagined that his consciousness deceives him; for, as Mr Hume justly observes, consciousness never deceives. He is certain of the *energy*, but finds by experience that the *instrument* of this energy has suddenly become disordered and unfit for its usual office. In this and this alone consists the difference between the paralytic and the man whose limbs are sound. The one may be as conscious of energy as the other, and his consciousness may be equally infallible. What then is this energy? Mr Hume will not say that it is an *idea*, for it is not the copy of any antecedent impression; besides, he has somewhere allowed that ideas are never active. Is it then a substance? Impossible! for it is not permanent: and we believe no man will venture to affirm, or even to suppose, that the same substance can be repeatedly annihilated, and as often created. Is it then the occasional exertion of some substance? This must be the truth; for no other supposition remains to be made. If so, that substance must be possessed of *power;* for a capacity of exerting actual energy is all that is meant by the word *power*. —"Wherever there is a *capability* of energy or exertion, there must be *power;* for though there can be no exertion without power, there may be power that is not exerted *. Thus a man may have *power* to speak when he is silent; he may have power to rise and walk when he sits still. But though it be one think to *speak* and another to have the *power* of speaking, we always conceive of the power as something which has a certain relation to the effect; and of every power we form our notion by the effect which it is able to produce. Nor is it only in speaking and moving his limbs that a man is conscious of energy. There is as much energy, though of a different kind, in *thinking* as in *acting*. Hence the powers of the human mind have been divided into active and speculative. By the former we move the body; and by the latter we see, hear, remember, distinguish, judge, reason, and perform upon our notions and ideas every other operation which is comprehended under the general word *to think*."

* *Reid's Essays on the Active Powers of Man.*

116 Locke's passive power an improper expression.

Mr Locke† has introduced into his theory of power another distinction than that which we have made between active and speculative powers. Observing by our senses, under which on this occasion memory is certainly included, various changes in objects, we collect, says he, a possibility in one object to be changed, and in another a possibility of making that change, and so come by that idea which we call power. Thus we say that fire has a power to melt gold, and that gold has a power to be melted. The first he calls *active*, the second *passive*, power. But to say that the *possibility* of being changed is *power*, seems to be a very improper mode of speaking, and such as may lead to consequences which the excellent author certainly held in abhorrence. It tends to make unwary readers imagine that the passive subject is as necessary to the existence of power, as the active being of which power is an attribute; but if the universe had a beginning, and if its Creator be immutable, two propositions which Mr Locke firmly believed, there certainly was power when there was no change, nor any thing existing which was capable of change. He owns, indeed, that active power is more properly called power than the other; but we see no propriety at all in passive power. "It is (in the language of Dr Reid) a powerless power, and a contradiction in terms."

† *Essay*, book ii. chap. 21.

117 Just observations of the same author respecting power as belonging to body or mind.

But though Locke here uses improper terms, he has other observations with which we have the honour fully to agree, and which lead to consequences the reverse of that impiety which seems to follow from the notion of *passive* power. He observes, that "we have from body no idea at all of thinking, nor any idea of the beginning of motion. A body at rest affords us no idea of any active power to move; and when it is set in motion itself, that motion is rather a passion than an action in it. For when the ball obeys the stroke of a billiard stick, it is not any action of the ball, but a passion: also, when by impulse it sets another ball in motion that lay in its way, it only communicates the motion it had received from another, and loses in itself so much as the other received; which gives us but a very obscure idea of an active power of moving in body, whilst we observe it only to transfer, but not to produce any motion. So that it seems to me, we have from the observation of the operation of bodies by our senses but a very imperfect obscure idea of active power, since they afford us not any idea in themselves of the power to begin any action either of motion or thought." He thinks it evident, however, "that we find in ourselves a power to begin or forbear, continue or end, several actions of our minds and motions of our bodies, barely by a thought or preference of the mind ordering, or, as it were, commanding, the doing or not doing such or such a particular action. This power which the mind has thus to order the consideration of any idea, or the forbearing to consider it, or to prefer the motion of any part of the body to its rest, and *vice versa* in any particular instance, is that which we call *will*. The actual exercise of that power, by directing any particular action, or its forbearance, is that which we call *volition* or *willing*.

118 Whence it follows, that only such beings as have will and understanding can possess real power.

According to Mr Locke, therefore, the only clear notion or idea we have of power is taken from the power which we find in ourselves to give certain motions to our bodies, or certain directions to our thoughts; and this power in ourselves can be brought into action only by willing or volition. This is exactly our doctrine; where we have endeavoured to prove, that without the consciousness of actual energy in ourselves, we never could have acquired any notion at all of power from observing the changes which take place among external objects. But if this be so, if the *power*, of which alone we know any thing, can be brought into

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into action only by willing or volition, and if will necessarily implies some degree of understanding, as in us it certainly does, it comes to be a question of the first importance, whether any being which possesses not will and understanding can be possessed of real power, or be the efficient cause of any action. This question we feel ourselves compelled to answer in the negative. If *we* had not will, and that degree of understanding which will necessarily implies, it is evident that we could exert no power, and consequently could have none: for power that cannot be exerted is no power. It follows also, that the power, of which alone we can have any distinct notion, can be only in beings that have understanding and will. Power to produce any effect, implies power not to produce it; and we can conceive no way in which power may be determined to one of these rather than the other in a being that has not will. We grow from infancy to manhood; we digest our food, our blood circulates, our heart and arteries beat; we are sometimes sick and sometimes in health: all these things must be done by the power of some agent, but they are not done by our power. And if it be asked how we know this? the answer is, because they are not subject to our will. This is the infallible criterion by which we distinguish what is our doing from what is not; what is in our power from what is not. Human power can be exerted only by will: and we are unable to conceive any active power to be exerted without will. If, therefore, any man affirms that a being may be the efficient cause of an action which that being can neither conceive nor will, he speaks a language which we do not understand. If he has a meaning, he must take the words *power* and *efficiency* in a sense very different from ours; for the only distinct notion, indeed the only notion which we can form, of real efficiency, is a relation between the cause and the effect similar to that between us and our voluntary actions. It seems therefore most probable, that such beings only as have some degree of understanding and will can possess active power, and that inanimate beings must be merely passive. Nothing which we perceive without us affords any good ground for ascribing active power to any inanimate being; and we can as little conceive such a being possessed of power as we can conceive it capable of feeling pain. On the other hand, every thing which we discover in our own constitution, leads us to think that active power cannot be exerted without will and intelligence; and to affirm that it can, is to affirm what to us at least is a contradiction in terms.

9 Objection obviated.

To this reasoning, which is Dr Reid's*, and which to us appears unanswerable, we have heard it objected, that a man born blind has the same evidence for the non-existence of colour that is here urged for the impossibility of power being exerted without will and understanding. If the objection had not been made by a very acute man, we should have deemed it altogether unworthy of notice; for between the two cases supposed to be similar there is hardly any analogy. A man born blind has no notion whatever of colour. If you describe it to him in the best manner that you can, and refer it to any of the senses which he possesses; if you say that it is the object of feeling, and that by feeling it one may perceive things at the distance of many miles; the blind man has reason to say that you are uttering a proposition which he knows with the utmost certainty cannot possibly be true. But if you tell him that colour is the object of the sense of sight, a sense which he possesses not; that it has not the least resemblance to the objects of the other senses; and that persons endowed with the sense of sight perceive coloured objects at the distance of many miles; the blind man cannot know whether what you say be true or false, because he has no idea or conception of the things of which you speak. This is not the case with respect to power; for every man who has reflected on the operations of his own mind has a very distinct notion of power, and knows perfectly, that to the actual exertion of the only power which he can conceive, will and understanding are necessary. Should it be said that there may be power altogether different from that of which we have a distinct conception, we think it sufficient to reply, that of a thing which cannot be conceived nothing can be either affirmed or denied; that activity exerted without will and understanding ought not to be called an exertion of *power*, because power is the name already appropriated to the attribute of a being by which he can do certain things if he wills; that as we can form no notion of a real efficient cause which has not will and understanding, so we have no reason to believe that such a cause any where exists; and to say that power, such as we can conceive, may be exerted without will and understanding, is as great an absurdity as to say that there may be velocity without space.

But if active power, in its proper meaning, requires a subject endowed with will and intelligence, what shall we say of those active powers which philosophers teach us to ascribe to matter, the powers of corpuscular attraction, magnetism, electricity, gravitation, and others? These powers, as they are called, shall be considered when we treat of the nature and source of corporeal motion. In the mean time, it is sufficient to observe, that whatever the agents may be in the operations of nature, whatever the manner of their agency or the extent of their power, they depend upon the first cause, and are all under his control.

Chap. VII. *Of* Truth, *and the different* Sources *of* Evidence.

Sect. I. *Of Truth.*

By pursuing these inquiries in the order which to us appears most natural, we are now led to the contemplation of those faculties of the human mind of which *truth* is properly the object. But what is *truth*? This was a famous question among the Greek sophists; which had been so often agitated, and to which so many absurd answers had been given, that it came at last to be doubted by men of the world whether a satisfactory answer could be given, or indeed whether the matter was worthy of investigation. It is well known, that among the ancient philosophers there was a sect called from their principles *Sceptics*, and from their founder *Pyrrhonians*, who openly avowed their opinion that *truth*, like virtue, is nothing but a name; that all things are equally true, or rather equally doubtful; and that it is in vain for man to hope for certainty in any inquiry in which he can be engaged. Such scepticism

* *Essays, Active powers.*

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scepticism as this no modern philosopher has professed; but many have had enough of it to make sober men hesitate about defining truth, and even insinuate that of truth no definition can be given. This surely is a mistake. If truth cannot be defined, it still wanders at large and in disguise, and vain must be the pursuit of every man who endeavours to obtain it; he is pursuing he knows not what.

120
Truth defined.

So obvious and so solid is this reflection, that almost every philosopher of merit who has lately written on the nature of evidence has begun his work, if not with a formal definition, with something at least equivalent to a definition of the object of his pursuit. To repeat all these definitions could serve no other purpose than to swell this article to a disproportioned bulk, and to perplex perhaps the mind of the reader. We shall therefore content ourselves with that which is given by Mr Wollaston. "Those propositions (says he) are true which represent things as they are: or, truth is the conformity of those words or signs by which things are expressed to the things themselves." Notwithstanding the objections of a very learned and acute writer (w), this is the best definition of *truth* which we have met with in any language. It is concise and perspicuous. It comprehends all kinds of truth, as well that which is merely mental, the subject of silent contemplation, as that which is communicated either by written language or by the living voice: and it makes truth itself immutable, as depending not upon the arbitrary constitution of this or that individual, or even of the whole human race (x), but upon the nature of things as established by their Almighty Creator.

121
Every proposition either true or false.

According to this definition, every proposition which

(w) Dr Tatham having asked, with a contemptuous air, How imperfect and illogical is the definition of truth given by Wollaston? proceeds, though not to define, to describe or characterise it himself. "Truth (says he) is of the nature and essence of God, like him *incomprehensible* in the whole, and *ineffable* in its sublimer parts. For these and other reasons it cannot admit of an *adequate definition*. And who, in the beginning of his researches, should presume to define that which, after all his longest and best conducted labours, he can only hope partially, and often imperfectly, to comprehend; and of which an important part can neither be *directly* expressed nor *directly* understood? We may indeed esteem ourselves highly favoured by the Author and finisher of all truth, if, at the end of our researches, we shall be able any way to understand, to define, and to apply, a few particular portions and detachments of it, and to guard them from ERROR and corruption. When upon a solemn occasion the question was put to our Lord by a Roman governor, *What is* TRUTH? though it was what he fully and perfectly knew, and what he came purposely and professedly to teach, he did not define it. He knew that definition was never the best method of instruction; and that in its common use and application it was seldom the friend of truth. Philosophically viewed, words do not constitute truth; they are only the vocal instruments by which it is communicated, or the written signs by which it is recorded. By an inquirer, therefore, things are to be examined rather than words defined. By a teacher, things are to be conveyed by words in some form or other, which are doubtless to be explained to the understanding, if not sufficiently understood before. But *explanation* is one thing, and *definition* quite another. Explanation is the *first* office of a teacher: Definition, if it be good, is the *last* of the inquirer, after the truth be found; and is then the most *advantageously* employed by the teacher, when his previous instructions have prepared him for it. GOD is a mind, and TRUTH is consequently an *attribute* of MIND. To the SUN, declaring at his rising a marvellous instrument, He, by whom all things were made, hath delegated the power of enlightening the *material* system; whilst he hath reserved to HIMSELF the office which is more suitable to his nature, of giving light and knowledge, by his eternal TRUTH, to the *mind* of man. But whether he act through the instrumentality of his creatures, or more *immediately* from himself, he is uniform and consistent in his operations; so that one part of his divine economy is always illustrative of another. As the SUN sheds his *light* over the material creation to be apprehended by the eye, TRUTH is the *light* shed down from heaven to be apprehended by the intellect, given to illumine every subject, natural and moral, corporeal and spiritual, so far as they are qualified by their different natures to convey it to the human mind, or rather perhaps so far as the human mind is qualified to receive it from them." *The Chart and Scale of Truth*, vol. I.

This passage, of which some parts are certainly not remarkable for perspicuity, seems to be descriptive, not of *truth* in the common acceptation of the word, but of *all knowledge* human and divine, of which indeed no adequate definition can be given. *Truth*, as here used, seems to be opposed to *ignorance*; as used by Mr Wollaston and others it is opposite to *falsehood*. In this last sense it may certainly be *explained*, if not defined: and if the learned lecturer will allow that Mr Wollaston has given a good *explanation* of the word *truth* as opposed to *falsehood*, we shall not quarrel with him or any man about the propriety of an expression. We have called it a *definition* of truth; because it was so called by the author from whom it is taken.

(x) Dr Beattie, in his elegant essay, has given a definition of truth very different from this, though it is possible that his meaning may be the same with Mr Wollaston's. "I account that to be *truth* (says he) which the constitution of our nature determines us to believe; and that to be *falsehood* which the constitution of our nature determines us to disbelieve." But if truth be really *immutable*, as he teaches or wishes to teach, it must depend upon the nature of things, and not upon the instinctive impulse of any particular constitution. It is always difficult, often impossible, to distinguish between the constitution of our nature, as it came from the hand of God, and the same constitution as it is moulded by arbitrary and capricious associations of our own. A sincere member of the Church of Rome certainly believes the doctrine of transubstantiation. How he may do so we have already shown. Were all mankind sincere members of that church, it would be said an which can be expressed or apprehended is necessarily either true or false, whether its truth or falsehood be perceived or not either by him who hears or by him who utters it. All propositions are either affirmative or negative; but before any thing can with certainty be affirmed or denied of another, we must know those things as they are in themselves, as well as the established use of the signs by which they are expressed. He who affirms or denies without this knowledge, speaks at random, and has no distinct meaning.

12 ...l.u ...aculty ...rned ...isition ...th.

Every faculty which we possess is in some way or other an instrument of knowledge; for we know by our senses, by our memory, and by our intellect. Every one of our faculties, therefore, is concerned in the acquisition of truth, and furnishes the mind with the materials of propositions. These propositions are indeed of various kinds; but they are all certainly true or certainly false, though the *certainty* of the truth or falsehood of every one it is not always in our power to perceive.

13 ...ity of ...f- ...ot ...th ...it is ...d.

When a man affirms that red is a quality inherent in a soldier's coat, he utters a proposition which every one of the vulgar firmly believes to be true, but which every philosopher knows to be false. This diversity of belief, however, affects not the truth of the proposition itself. All mankind know that it is either true or false, independent of them or their perceptions; and it is easy, by a few optical experiments and by an explanation of terms, to convince them all, that what they have agreed to call *red* is no quality inherent in external objects, but only a sensation caused by the impulse of certain rays of light reflected from certain objects to the eye of the percipient. The contrariety therefore in this case of vulgar to philosophical belief, does not result from any ambiguity in the nature of truth itself, but from the different means of perception which the clown and the philosopher possess.

Again, were a man looking at a red and a green object, to affirm that they are both of the same colour, he would affirm what in one sense may be true, what in another is undoubtedly false, and what in a third may be either true or false. If it be his meaning that the two objects give to him the same sensation, he may know with the utmost certainty that what he says is true; if he mean that they affect all mankind precisely as they affect him, he utters what all mankind with the most absolute certainty know to be false; if he mean that the texture of the two bodies (that particular disposition of parts on their surfaces which makes them reflect certain rays of light and absorb others) is exactly similar, so as that the one must reflect the very same kind of rays with the other, he utters what all mankind must *believe* to be false, though still it is *possible* that what he affirms may be true. This diversity of belief affects not the truth itself. The two objects are what they are by whomsoever perceived, or whether perceived or not; the rays of light reflected by each are what they are, whether they fall upon this, upon that, or upon any eye; and the sensation communicated to this singular man is certainly what he is conscious it is, as those of the rest of mankind are with equal certainty what they are conscious of. This being the case, it is obvious and undeniable, that the organs of sight in this individual of the human race are somehow differently formed from those of other men: and the only question which can occasion a doubt in the mind of the sceptic is, whether his or their eyes be so formed as to represent things falsely? for that by the one or the other things are falsely represented, is as evident as that two contradictory propositions cannot both be true. Now, though, for any thing we know it is certainly possible, as to us it appears not to imply any contradiction, that the eyes of but one man are formed in a manner suitable to their objects, whilst the eyes of all other men are formed to deceive them; yet the contrary is so highly probable, that no man really doubts of it any more than he doubts whether three and two be equal to five.

124 Why some truths are said to be absolutely and others morally certain.

This last proposition is indeed said to express a truth absolutely certain, whilst the former expresses a truth which is called morally certain: not that there is any difference or degrees of certainty in the nature of truths themselves; the only difference is in our power of perceiving them. That three and two are equal to five, is said to be an absolute truth; because we perceive the whole of it as it is in itself, and are convinced that every intelligence from the highest to the lowest who understands the terms in which it is expressed perceives it as we do: whereas of *moral* or *physical* truths, as they are called, we only perceive a part, and may therefore mistake for want of evidence. Thus, in the case of the two objects exhibiting the same colour to one man, whilst they exhibit different colours to all other men, could we see into the objects themselves, and comprehend them immediately with our intellect as we comprehend our own ideas, it might, and no doubt would, appear as palpable a contradiction to say that the particular disposition of the parts on their surfaces, which reflect the rays of light, are the same in both, as it is now to affirm that three and two are not equal to five. Between truth and falsehood there is no medium. All truths are in *themselves* equally certain; and to the Supreme Being, who knows the nature of every thing more fully and intimately than we know our own ideas, they all *appear* equally certain: but yet we may without absurdity speak of *probable* truth as well as of *certain* truth, provided always that we make the difference to result, not from the nature of things, but from the power of our understanding, which comprehends the one kind of truth wholly and the other only partially.

125 Why some truths are said to be eternal and necessary, whilst others are considered as temporary and contingent.

There is another division made of truth into that which is eternal and necessary, and that which is temporary and contingent. Though we do not approve of

7

and thought, "that the constitution of human nature determines men to believe transubstantiation:" a doctrine which, though it is rejected by millions, Pere Buffier has laboured hard to reconcile with common sense. Yet it is certain that the same body cannot be in different places at the same time; and that therefore transubstantiation must be false, though believed by all mankind. Our *believing* any thing does not make it true, nor our *disbelieving* any thing make it false. We must, indeed, *act* according to our belief; but in every instance truth and falsehood would have been what they are, though we had never existed.

Of Truth.

of applying the epithets *temporary* and *eternal* to any thing but real exiſtences, yet as this manner of ſpeaking has been uſed by all philoſophers, we ſhall give inſtances of each kind of truth, and endeavour to aſcertain in what the diſtinction conſiſts. "The three angles of a plain triangle are equal to two right angles," is a propoſition expreſſive of a neceſſary and eternal truth. "The world exiſts," is a contingent and temporary truth. Here it is obvious, that if both theſe propoſitions be true, there is no diſtinction between them, ſo far as mere *truth* is concerned; for truth admits not of degrees of compariſon. It is however ſaid, that the firſt propoſition depends not upon time, or will, or any thing elſe; and that the Supreme Being himſelf could not make it falſe: whereas it is certainly poſſible, that he who created the world could annihilate it, and thus reduce what is now a truth to an abſolute falſehood. This difference between the two propoſitions is thought a ſufficient ground for calling the former a *neceſſary* and *eternal* truth, and the latter a *temporary* and *contingent* truth. But is the difference itſelf real? In the preſent inſtance we cannot think that it is: for if the right angles and triangles, which conſtitute the materials of the former propoſition, be real corporeal things, they may be annihilated as well as the reſt of the world; and then the truth of the propoſition will ceaſe, for there can be neither equality nor inequality between nonentities. If the angles and triangles be merely ideas in the mind of a rational being, it is not to be denied that the propoſition muſt be true, independent of all *will*, whenever thoſe ideas exiſt, *i. e.* whenever right angles and triangles are *thought upon*; but if all reaſonable creatures were to be annihilated, and the Supreme Being never to think of triangles, the propoſition would unqueſtionably ceaſe to be either true or falſe. The world may indeed be annihilated; but it certainly is not annihilated whilſt any one creature exiſts to contemplate even that which is called *neceſſary* and *eternal* truth: and therefore whilſt any truth exiſts in a mind not divine, it muſt be neceſſarily true that the world exiſts; for the individual being by which truth is perceived would then conſtitute the whole world.

But if in a ſomewhat different manner we compare the former of theſe propoſitions with this—"The ſolar ſyſtem conſiſts of the ſun and at leaſt ſeven primary planets"—we ſhall at once perceive the difference between neceſſary and contingent truths. Both propoſitions we know to be true at this moment: but there is this difference between them, that a plain triangle can neither actually exiſt at any period of duration, nor be conceived by any one mind divine or human, of which the three internal angles are not preciſely equal to two right angles; whereas the ſolar ſyſtem may eaſily be conceived, and might certainly have been formed, with a ſmaller number of primary planets rolling round the central fire. This needs no proof; as it is well known, that till very lately we conceived the ſyſtem to conſiſt of the ſun and only ſix primary planets; and it has been already ſhown, that whatever we can poſitively conceive may poſſibly exiſt. Thus, then, every propoſition, of which the contrary is clearly and diſtinctly perceived to be impoſſible, is a *neceſſary* truth; and it may likewiſe be ſaid to be *eternal*, becauſe at every period of duration it muſt of neceſſity when thought upon be perceived to be true: On the other hand, every propoſition of which the contrary may be clearly and diſtinctly conceived, is, if true, only a *contingent* truth, becauſe its contrary might have exiſted; and it may likewiſe be called *temporary*, becauſe what might have been falſe in time paſt may yet be falſe in time future.

Though all our faculties (our ſenſes, our memory, and our intellect) furniſh materials for propoſitions, and are therefore all ſubſervient to the inveſtigation of truth; yet the perception of truth, as it is in itſelf, is commonly aſcribed to our rational faculties; and theſe have by Locke and others been reduced to two—reaſon and judgment. The former is ſaid to be converſant about certain truths, the latter chiefly about probabilities.

Some late philoſophers of great merit, diſſatiſfied with this analyſis of the intellect, have added to reaſon and judgment a third faculty, to which they have given the name of *common ſenſe*, and of which the proper object is ſuch truths as neither admit nor ſtand in need of evidence. By *common ſenſe* they mean, "that degree of judgment which is common to men with whom we can converſe and tranſact buſineſs." Whether the introduction of ſuch a term into metaphyſics was proper or improper, we do not think it of importance to inquire. According to this definition of it, which is Dr Reid's, it differs not from the *reaſon* (x) and *judgment* of Locke; agreeing with the former when its

(x) This is expreſsly acknowledged by Dr Reid. "It is abſurd (ſays that able and candid writer) to conceive that there can be any oppoſition between reaſon and common ſenſe. It is indeed the firſt-born of reaſon; and as they are commonly joined together in ſpeech and in writing, *they are inſeparable in their nature*. We aſcribe to reaſon two offices or two degrees: The firſt is to judge of things ſelf-evident; the ſecond to draw concluſions that are not ſelf-evident from thoſe that are. The firſt of theſe is the province, and the ſole province, of common ſenſe; and therefore it *coincides with reaſon in its whole extent*, and is only *another name* for one branch or one degree of reaſon." Pere Buffier talks nearly the ſame language; but Dr Beattie expreſſes himſelf very differently. "That there is a real and eſſential difference between theſe two faculties; that common ſenſe cannot be accounted for by being called the *perfection of reaſon*, nor reaſon by being reſolved into *common ſenſe*; will appear (he thinks) from the following remarks. 1. We are conſcious, from internal feeling, that the energy of underſtanding, which perceives intuitive truth, is different from that other energy which unites a concluſion with a firſt principle by a gradual chain of intermediate relations. 2. We cannot diſcern any neceſſary connection between reaſon and common ſenſe." Nay, he ſays, "That we often find men endued with the one who are deſtitute of the other:" and he inſtances dreams and certain kinds of madneſs where this is the caſe; adding, that a man who believes himſelf its object is certain truth, and with the latter when it is conversant about probabilities. Nothing indeed is more evident, than that in the assent of the mind to every proposition, some energy of the judgment is exerted; and upon every proposition not self-evident, reasoning of some kind or other must be employed to procure that assent. Instead therefore of perplexing ourselves and our readers with various analyses of the human understanding, or rather with various names to what after all is perhaps but one individual power, it will surely be of more importance to the cause of truth to examine the different sources of evidence by which the assent of the reason, or judgment, or common sense, is determined.

Under the article Logic it was observed, that *intuition*, *experience*, and *testimony*, are each a sufficient *ground of judgment*; but they are not the only grounds. *Consciousness* is certainly one source of evidence, perhaps the most complete of any; and, in a low degree, *analogy* is another. Of *consciousness* we have already treated, but of *analogy* we have yet said nothing: and though we might (for an account of *intuition*, *experience*, and *testimony*) refer our readers to the article Logic, where they are accurately though concisely explained, we shall, without repeating what has been already said, add a few words on each, as well to complete the present article as to supply the deficiencies of the former.

Sect. II. *Of Intuitive Evidence and Demonstration.*

Intuitive evidence is that which arises from the comparison of two or more ideas or notions when their agreement or disagreement is perceived immediately, without the intervention of any third idea or notion. Of this kind is the evidence of these propositions: One and four make five*; things equal to "the same thing are equal to one another; the whole is greater than any of its parts;" and in a word, all the axioms in arithmetic and geometry. All these are in reality propositions in which the subject and predicate appear upon comparison to be nothing more than the same thing taken in different views or expressed by different terms. In fact, they are all in some respect reducible to this axiom, "Whatever is, is." We do not say that they are deduced from it; for they have in themselves that original and intrinsic evidence which makes them, as soon as the terms are understood, to be perceived intuitively. And if they be not thus perceived, no deduction of reason will ever confer on them any additional evidence. But though not deduced from the general axiom, they may be considered as particular exemplifications of it; inasmuch as they are all implied in this, that the properties and relations of our clear and adequate ideas can be no other than what the mind clearly perceives them to be. Of Intuitive Evidence and Demonstration

129 Every demonstration a series of propositions intuitively evident.

It may perhaps be thought, that if axioms were propositions perfectly identical, it would be impossible by their means to advance a single step beyond the simple ideas first perceived by the mind. And it would indeed be true, that if the predicate of the proposition were nothing but a repetition of the subject under the same aspect, and in the same or synonymous terms, no conceivable advantage could be made of it for the furtherance of knowledge. Of such propositions as these, for instance, "seven are seven, eight are eight, the three angles of a triangle are the three angles of a triangle, two right angles are two right angles," it is manifest that we could never avail ourselves for the improvement of science: But when the thing, though in effect coinciding, is considered under a different aspect; when that which is single in the subject is divided in the predicate, and conversely; or when what is a whole in the one is regarded as a part of something else in the other; such propositions lead to the discovery of innumerable and apparently remote relations. It is by the aid of such simple and elementary principles that the arithmetician and the algebraist proceed to the most astonishing discoveries. Nor are the operations of the geometrician essentially different: for to this class belong all propositions relating to number and quantity; that is, all which admit of mathematical demonstration. If the truth of a mathematical proposition be not self-evident; in other words, if the subject and predicate do not appear at first sight to be different names for the same thing, another term must be found that shall be synonymous to them both. Thus, to prove that the three internal angles of a right-lined triangle are equal to two right angles, I produce the base of the triangle; and by a very short process I discover that the exterior angle so formed is equal to the two interior and opposite angles. By a process equally plain and short, I perceive that the exterior angle and the interior adjacent angle are equal to two right angles: But I have already seen, that the exterior angle is neither more nor less than the two interior and opposite angles under a different aspect; whence it appears that the three internal angles of the triangle are nothing else than two right angles under a different aspect. In a word, all demonstration is founded on first principles or primary truths, which neither

self made of glass, shall yet reason very justly concerning the means of preserving his supposed brittleness from flaws and fractures." Surely these are strange remarks. Dreams and madness have hitherto been supposed to originate in the imagination, or, as it was denominated by the ancient philosophers, the *phantasia*: and when the ideas or forms which are there treasured up are disarranged or absurdly compounded, a dreaming sane man or a waking madman, if he reason at all, must reason from absurd principles; not, however, through any defect of common sense, but from a disorder in that region of the brain, upon which the phantasia more immediately depends. Of his first remark, we can only say, that to us it appears to be the reverse of truth. In every proposition which admits of demonstration, *we* are conscious that the conclusion is united with the first principle by a repetition of the very same energy of the understanding which perceives intuitive truth. That this is the case in every one of Euclid's demonstrations, we appeal to every mathematical reader; and why it must be so, we shall by and by endeavour to evince.

Of Intuitive Evidence and Demonſtration

neither admit nor ſtand in need of proof, and to which the mind is compelled to give its aſſent by a bare intuition of the ideas or terms of which theſe primary truths are compoſed. Nothing is ſuſceptible of demonſtration, in the rigid ſenſe of the word, but general, neceſſary, and eternal truths; and every demonſtration is built upon intuition, and conſiſts in a ſeries of axioms or propoſitions of the very ſame kind with the firſt principle or truth from which the reaſoning proceeds. That propoſitions formerly demonſtrated are taken into the ſeries, doth not in the leaſt invalidate this account; inaſmuch as theſe propoſitions are all reſolvable into axioms, and are admitted as links in the chain; not becauſe neceſſary, but merely to avoid the uſeleſs prolixity which frequent and tedious repetitions of proofs formerly given would occaſion. But it is obvious that ſuch truths only as reſult from the compariſon of ideas and notions are neceſſary; and of courſe that ſuch truths only are capable of ſtrict demonſtration. The truths which relate to real exiſtences are all contingent, except that which affirms the exiſtence of the Supreme Being, the Parent of all truth.

The mathematical ſciences, categorical logic, and that part of metaphyſics which demonſtrates the being of God, are therefore the only branches of human knowledge which admit of ſtrict demonſtration. The longeſt demonſtration in the mathematical ſciences may be traced to this general and neceſſary truth, "Whatever is, is," or to ſome particular exemplification of it: the longeſt train of categorical ſyllogiſms terminates in this general principle, "What is affirmed or denied of a whole *genus*, may be affirmed or denied of all the *ſpecies* and all the *individuals* belonging to that genus:" and the metaphyſical demonſtration of the being of God reſts upon this foundation, "Whatever had a beginning, had a cauſe." That theſe are truths abſolutely certain, which can neither be proved nor called in queſtion, every man may be ſatiſfied, merely by attending to the ideas or notions which the terms of each propoſition expreſs. The two firſt are merely identical propoſitions, of the truth of which no man has ever pretended to doubt; and though the laſt is not identical, it is a neceſſary and ſelf-evident truth, as its contrary implies, that in the ſame thing there is power and no power, change and no change, action and inaction, at the ſame inſtant.

130
It is by intuition that we acquire all our notions of relation.

Before we diſmiſs the ſubject of intuition, it may not be improper to obſerve, that it is by this faculty or power of the mind contemplating its ideas, and comparing one idea with another, that we acquire all our notions of relation; ſuch as *identity* and *diverſity*, *reſemblance*, *coexiſtence*, relations of *ſpace* and *time*, relations of *quantity* and *number*, of a *cauſe* to its *effect*, and many more which it would be uſeleſs as well as tedious to enumerate.

Sect. III. *Of Experience and Analogy.*

131
Experience, the reſult of repeated obſervations.

It has been juſt obſerved, that intuition and demonſtration are applicable only to general and neceſſary propoſitions, of which the contrary are not only falſe, but abſurd and impoſſible. The great buſineſs of life, however, is with facts and contingent truths, which admit not of demonſtration, but reſt upon other evidence. The ſenſes, external and internal, are the inlets to all our knowledge of facts; and the memory is the ſtorehouſe where that knowledge is preſerved. Of what a man ſees or feels, he can at the inſtant of ſeeing or feeling entertain no doubt; and whilſt the ideas of what he has ſeen or felt, with all their aſſociated circumſtances, remain vivid and diſtinct in his memory, he is conſcious that he poſſeſſes ſo much real knowledge. But all our knowledge, as it is derived from the ſenſes, is of particular facts or particular truths; and the man who has in certain circumſtances obſerved one particular phenomenon, for the exiſtence of which he perceives no *neceſſity*, has not ſufficient ground to conclude, that in ſimilar circumſtances ſimilar phenomena will always occur. Milton, who ſurpaſſed the greater part of his contemporaries in philoſophical ſcience almoſt as far as he has ſurpaſſed all ſucceeding poets in the ſublimity of his genius, repreſents Adam, when firſt falling aſleep, as under apprehenſions that he was about to ſink into his original ſtate of inſenſibility:

> ———————— " Gentle ſleep
> " Firſt found me, and with ſoft oppreſſion ſeiz'd
> " My drouſed ſenſe, untroubled; though I thought
> " I then was paſſing to my former ſtate
> " Inſenſible, and forthwith to diſſolve."

Apprehenſions ſimilar to theſe would take place in his mind when he firſt perceived that darkneſs had overſpread the earth. In his circumſtances, he could have no ground to expect that the ſun when once ſet would riſe again to relume the world, as he had not then experienced the alternate ſucceſſion of light and darkneſs, and probably knew not whence light proceeds. After ſome time, however, having obſerved day and night regularly to ſucceed each other, theſe two appearances, or the ideas of them, would be ſo aſſociated in his mind, that each ſetting ſun would ſuggeſt the idea of next ſun-riſing, and lead him to expect that glorious event with the utmoſt confidence. He would then conſider the alternate ſucceſſion of day and night as a law of nature, which might be affirmed in a propoſition expreſſive of a certain truth.

1[...]
Is the only evidence that we have for the general truths in phyſics, even for those which we think intuitively certain

This continued obſervation of the ſame event happening in the ſame or ſimilar circumſtances, is what we call *experience;* and it is the only evidence which we have for all the general truths in phyſics, even for thoſe which we are apt to think intuitively certain *. Thus, that *milk* is white, and that *gold* is yellow, are ſuppoſed to be univerſal and neceſſary truths: but for any thing that we know, they may be particular truths; and they are certainly contingent, as the contrary to either of them may be ſuppoſed without abſurdity. We have indeed always obſerved the milk of animals of every ſpecies *white;* and therefore the idea of *white* becomes a neceſſary part of our *idea* of the ſubſtance milk, of which we call whiteneſs an eſſential property. This, however, reſpects only the milk of thoſe animals with which we are acquainted. But ſince the milk of all the animals with which we are acquainted, or of which we have heard, is white, we can have no reaſon to ſuſpect that the milk of any new and ſtrange animal is of any other colour. Alſo, ſince, wherever there has been the ſpecific gravity, ductility, and other properties of *gold*, the colour has always been *yellow;* we conclude that theſe circumſtan-

* Ca[...] Philoſ[...] of Rh[...] and [...] ley's [...] marks [...] Drs [...] &c.

ces are neceſſarily united, though by ſome unknown bond of union, and that they will always go together.

53 The proper proof, therefore, of ſuch univerſal propoſitions as "that milk is white," "that gold is yellow," or "that a certain degree of cold will freeze water," conſiſts in what is called an induction of *particular facts* of preciſely the ſame nature. Having found, by much and various experience, that the ſame events never fail to take place in the ſame circumſtances, the *expectation* of the ſame conſequences from the ſame previous circumſtances is neceſſarily generated in our minds; and we can have no more ſuſpicion of a different event than we can ſeparate the *idea* of *whiteneſs* from that of the other properties of *milk*.—When the previous circumſtances are preciſely the ſame, we call the proceſs of proof by the name of *induction*, and expect the event from *experience*: but if they be not preciſely the ſame, but only bear a conſiderable reſemblance to the circumſtances from which any particular appearance has been found to reſult, we call the argument *analogy*; and it is ſtronger in proportion to the degree of reſemblance in the previous circumſtances. Thus the milk of all the cows that we have ſeen, or upon which we have made the experiment, having been found nouriſhing, we confidently expect that the milk of all other cows will prove nouriſhing likewiſe; and this confidence of expectation is the reſult of uniform experience. But if, from having found the milk of all the animals with which we are acquainted to be nouriſhing, however different the nature of theſe animals; we infer that the milk of any ſtrange animal will likewiſe be nouriſhing; the inference is drawn by analogy, and by no means carries with it the conviction of experience. A proof from *real* experience can leave no doubt in the mind (B); an argument from analogy always muſt. In the one caſe, we only infer that two events of preciſely the ſame nature and in preciſely the ſame circumſtances have been produced by the ſame kind of cauſe; in the other, we infer that two events ſimilar in moſt reſpects, though for any thing that we know diſſimilar in others, have been produced by the ſame kind of cauſe; and it is obvious that between theſe caſes the difference is great.

4. Thus, after having obſerved that all the projectiles to which we have paid any attention—a ſtone thrown from the hand, a ball from a gun, and an arrow from a bow—deſcribe a certain curve, and are impelled in that curve by two powers acting in different lines of direction which form with each other a certain angle, we infer that all projectiles which on the ſurface of the earth deſcribe the ſame curve are impelled by the ſame or ſimilar powers acting in the ſame or ſimilar lines of direction. This inference is the reſult of experience, and carries with it the fulleſt conviction to the mind. But when, from having obſerved that the curves deſcribed by the planets are of the ſame kind with thoſe deſcribed by projectiles on the earth, Sir Iſaac Newton inferred that theſe vaſt bodies are impelled in their orbits by forces of the very ſame kind, and acting in the ſame manner with the forces which impel a ball from a cannon or an arrow from a bow, his argument was founded only on analogy; and even that analogy is very remote. We know by experience that all projectiles which fall under our immediate cogniſance are of the very ſame kind and in the very ſame circumſtances; that every one of them has a tendency, from whatever cauſe, to the centre of the earth, and is preſerved from falling by the force of projection; we know likewiſe that they are all moved thro' the medium of the atmoſphere, which at the ſurface of the earth is conſiderably denſe, and that a denſe medium muſt occaſion much reſiſtance: But we do not *know* that the planets have a tendency to the centre of the ſun, that they are preſerved from falling into that luminary by a projectile force, or whether they move through a *medium* or *in vacuo*: ſo that we are not *certain* that the motion of the planets is perfectly ſimilar to that of terreſtrial projectiles in any other circumſtance than the form of the curve which they all deſcribe; and from this ſingle caſe of coincidence no inference can be drawn which carries to the mind abſolute conviction.

When a man reaſons from *experience*, he infers, that what has uniformly happened hitherto, will happen always in the very ſame circumſtances; or that what is known to be the cauſe of *various phenomena of the ſame kind* is the cauſe of every other phenomenon in *all reſpects* ſimilar to theſe. Such an inference is founded on the united and complete evidence of ſenſe, memory, and reaſon. When a man reaſons from *analogy*, he infers, that what has *generally* happened hitherto, will

Of Experience and Analogy.

(z) We ſay from *real* experience; becauſe what is often taken for *experience*, and to human eyes has that appearance, is in fact nothing more than *analogy*. Thus a phyſician may have preſcribed to ninety-nine patients labouring under the ſame diſeaſe the ſame remedy, and always with the ſame ſucceſs. If ſo, he will think that he has experience of its utility, and will preſcribe it again with the fulleſt confidence. Yet in this caſe he may be diſappointed; for though the medicine be the ſame and the diſeaſe the ſame, there may be ſomething in the conſtitution of the hundredth patient ſo different from that of the ninety-nine, that what was ſalutary to them may be pernicious to him. This does not detract from the evidence of experience: it only ſhows, that the circumſtances of the caſe in which the medicine failed were different from thoſe in which it ſucceeded. In ſuch concluſions as are founded on a complete induction and uniform experience, every man expects the event with the laſt degree of aſſurance, and regards his paſt experience as a full *proof* of the future exiſtence of that event: In other caſes, where experience has been variable—or apparently variable—he knows that the induction has been incomplete, and therefore proceeds with caution. He weighs the oppoſite experiments; takes as complete a view as he can of the circumſtances in which they were made; conſiders which ſide is ſupported by the greater number of experiments, and inclines to that ſide with doubt and heſitation. And when at laſt he fixes his judgment, the evidence exceeds not what is called *probability*. All probability, then, ſuppoſes an oppoſition of experiments and obſervations, where the one ſide is found to overbalance the other, and to produce a degree of evidence proportioned to the ſuperiority.

will happen again in circumſtances *nearly ſimilar*; or that what is known to be the cauſe of various phenomena of the ſame kind, is the cauſe of other phenomena in *ſome reſpects* ſimilar to theſe. This inference is likewiſe founded on the united evidence of ſenſe, memory, and reaſon: but here the evidence of ſenſe is not complete, and it can be ſtrengthened only by finding more facts of the ſame or of a ſimilar nature.

Sect. IV. *Of Teſtimony.*

135 Mankind ready to believe the teſtimony of each other.

The laſt ſource of evidence which we propoſed to conſider is *teſtimony*, or the report of men concerning events which have fallen under the obſervation of their ſenſes. That we are all ready to believe the information which we receive from the teſtimony of our fellow creatures is undeniable; and indeed without ſuch belief every man's knowledge of facts and events would be confined to thoſe only of which he himſelf had been a perſonal witneſs. In that caſe, no man who had not travelled would believe that there are ſuch cities as Rome and Conſtantinople; and no man whatever could now believe that ſuch heroes as Hannibal and Ceſar had ever exiſted.

Between words and things there is no natural connection; and though we are all accuſtomed to give to things the names by which they are known in the language that we ſpeak, and to expreſs their mutual relations by the words appropriated for that purpoſe; yet it is obviouſly impoſſible to denote one thing by the name of another, and to expreſs by words relations that have no exiſtence. This being the caſe, it may be aſked upon what principle we give credit to human teſtimony? To this queſtion various anſwers have been given, which have produced much controverſy on one of the moſt important ſubjects which can employ the mind of man.

136 The reaſon aſſigned by Hume for this propenſity

"We may obſerve (ſays Mr Hume*), that there is no ſpecies of reaſoning more common, more uſeful, and even neceſſary to human life, than that which is derived from the teſtimony of men and the reports of eye-witneſſes and ſpectators. This ſpecies of reaſoning perhaps one may deny to be founded on the relation of cauſe and effect. I ſhall not diſpute about a word. It will be ſufficient to obſerve, that our aſſurance in any argument of this kind is derived from no other principle than our obſervation of the veracity of human teſtimony, and of the uſual conformity of facts to the reports of witneſſes. It being a general maxim that no (A) objects have any diſcoverable connection together, and that all the inferences which we can draw from one to another are founded merely on our experience of their conſtant and regular conjunction; it is evident that we ought not to make an exception to this maxim in favour of human teſtimony, whoſe connection with any event ſeems in itſelf as little neceſſary as any other. Were not the memory tenacious to a certain degree; had not men commonly an inclination to truth, and a principle of probity; were they not ſenſible to ſhame when detected in falſehood: Were not theſe, I ſay, diſcovered by *experience* to be qualities inherent in human nature, we ſhould never repoſe the leaſt confidence in human teſtimony. And as the evidence derived from witneſſes and human teſtimony is founded on paſt experience, ſo it varies with the experience, and is regarded either as a *proof* or *probability*, according as the conjunction between any particular kind of report and any kind of object has been found to be conſtant or variable. There are a number of circumſtances to be taken into conſideration in all judgments of this kind; and the ultimate ſtandard by which we determine all diſputes that may ariſe concerning them, is always derived from experience and obſervation. The reaſon why we place any credit in witneſſes and hiſtorians, is not derived from any *connection* which we perceive *à priori* between teſtimony and reality, but becauſe we are accuſtomed to find a conformity between them. But when the fact atteſted is ſuch a one as has ſeldom fallen under our obſervation, here is a conteſt of two oppoſite experiences; of which the one deſtroys the other as far as it goes, and the ſuperior can only operate on the mind by the force which remains. The very ſame principle of experience which gives us a certain degree of aſſurance in the teſtimony of witneſſes, gives us alſo, in this caſe, another degree of aſſurance againſt the fact which they endeavour to eſtabliſh; from which contradiction there neceſſarily ariſes a counterpoiſe, and mutual deſtruction of belief and authority."

* Eſſay on Miracles.

This account of the origin of faith in teſtimony has been controverted with much ſucceſs by the Doctors Campbell and Reid. "That the evidence of teſtimony is derived ſolely from experience (ſays the former of theſe writers §), is at leaſt not ſo inconteſtable a truth as Mr Hume ſuppoſes it; that, on the contrary, teſtimony hath a natural and original influence on belief antecedent to experience, will, I imagine, eaſily be conceived. For this purpoſe, let it be remarked, that the earlieſt aſſent which is given to teſtimony by children, and which is previous to all experience, is, in fact, the moſt unlimited; that by a gradual experience of mankind, it is gradually contracted, and reduced to narrower bounds. To ſay, therefore, that our diffidence in teſtimony is the reſult of experience, is more philoſophical, becauſe more conſonant to truth, than to ſay that our faith in teſtimony has this foundation. Accordingly, youth, which is unexperienced, is credulous; age, on the contrary, is diſtruſtful. Exactly the reverſe would be the caſe were this author's doctrine juſt." This is a complete confutation of the reaſoning of Mr Hume: but in order to prevent all cavilling, it is to be wiſhed that the very acute author had explained more fully what he means by ſaying, that teſtimony hath a *natural* and *original* influence on belief; for theſe words may be taken in different ſenſes, in one of which what he affirms is true, and in another falſe. 137 confuted

§ Diſſertation on Miracles, and The Philoſophy of Rhetoric

Dr

(A) Is there then no diſcoverable connection between a tree and the field in which it grows; between a man and his cloaths; between an author and his work; between a ſceptic and paradoxes? Surely all theſe are correlates, and neceſſarily ſuggeſt the ideas of each other.

Of Teſtimony.

Dr Campbell's omiſſion is amply ſupplied by Dr Reid, who gives § the following account of teſtimony, and of the credit which it obtains. "The wiſe and beneficent Author of nature, who intended that we ſhould be ſocial creatures, and that we ſhould receive the greateſt and moſt important part of our knowledge by the information of others, hath, for theſe purpoſes, implanted in our nature two principles that tally with each other. The firſt of theſe principles is a propenſity to ſpeak truth, and to uſe the ſigns of language ſo as to convey our real ſentiments. This principle has a powerful operation even in the greateſt liars; for where they lie once, they ſpeak truth a hundred times. Truth is always uppermoſt, and is the natural iſſue of the mind. It requires no art or training, no inducement or temptation, but only that we yield to a natural impulſe. Lying, on the contrary, is doing violence to our nature, and is never practiſed even by the worſt men without ſome temptation. Speaking truth is like uſing our natural food, which we would do from appetite, although it anſwered no end; but lying is like taking phyſic, which is nauſeous to the taſte, and which no man takes but for ſome end which he cannot otherwiſe attain.—When we are influenced by any motive, we muſt be conſcious of that influence, and capable of perceiving it upon reflection. Now, when I reflect upon my actions moſt attentively, I am not conſcious that in ſpeaking truth I am influenced on ordinary occaſions by any motive moral or political. I find that truth is always at the door of my lips, and goes forth ſpontaneouſly if not held back. It requires neither good nor bad intention to bring it forth, but only that I be artleſs and undeſigning. There may indeed be temptations to falſehood, which would be too ſtrong for the natural principle of veracity, unaided by principles of honour or virtue; but where there is no ſuch temptation, we ſpeak truth by *inſtinct*. By this inſtinct, a real connection is formed between our words and our thoughts; and thereby the former become fit to be ſigns of the latter, which they could not otherwiſe be."

§ Inquiry into the Human Mind,

Such is the account which Dr Reid gives of the truth of human teſtimony: and he adds, that there is another original principle implanted in us by the Supreme Being, to tally with it, viz. a diſpoſition to confide in the veracity of others, and to believe what they tell us. "This (he ſays) is the counterpart to the former; and as that may be called the *principle of veracity*, we ſhall, for the want of a more proper name, call this the *principle of credulity*. It is unlimited in children, until they meet with inſtances of deceit and falſehood; and retains a very conſiderable degree of ſtrength through life."

It is ever with extreme reluctance that we controvert the opinions of this able writer; and that reluctance cannot be leſſened in the preſent inſtance, when we are conſcious that great part of what he ſays is unanſwerable. That truth is always at the door of the lips; that it requires no effort to bring it forth; that in ordinary caſes men ſpeak truth uninfluenced by any motive moral or political; that the greateſt liars ſpeak truth a hundred times where they lie once; and that lying is never practiſed by the worſt men without ſome temptation, are poſitions which daily experience renders it impoſſible to queſtion: But notwithſtanding this, we do not think that truth is ſpoken by an *inſtinctive* principle; becauſe it is inconceivable that inſtinct ſhould teach the uſe of arbitrary and artificial ſigns, ſuch as the words of every language undoubtedly are; or that between ſuch ſigns and ideas any *inſtinctive* connection ſhould ever be formed. "Truth (as we have defined it) is the conformity of thoſe words or ſigns by which things are expreſſed, to the things themſelves;" and things themſelves are what they are, independent of us, our inſtincts, and perceptions. When we have preciſe and adequate ideas of objects, and when thoſe ideas are related to one another as the objects themſelves are related, we are in poſſeſſion of mental truth; and in this caſe there is a *real* and *natural* connection between the ſigns and the things ſignified: for we cannot frame original and ſimple ideas which have no archetype in nature; nor can *one* object, diſtinctly perceived, generate in our minds the ideas that are generated by *other* objects. Here external things are the objects, and ideas are the ſigns, which, when they are in conformity to the things ſignified by them, conſtitute truth.

158 The true reaſon aſſigned.

But in human teſtimony, the ideas in the mind of the ſpeaker are the things ſignified, and the words of language are ſigns by which they are expreſſed; and when theſe things and ſigns are in conformity to each other, the words uttered expreſs ſo much truth.—Now, though in this caſe there is no *natural* connection between the ſign and the thing ſignified, yet it is obvious, that without a violent effort of the ſpeaker to the contrary they muſt always be in conformity with each other, becauſe, in every language, there are words appropriated for the purpoſe of denoting every idea and relation which can be expreſſed; and in the mind of every man theſe ideas, relations, and *words*, have been conſtantly aſſociated from the time that he learned to ſpeak. So intimate is this aſſociation, and ſo impoſſible to be broken, that whoever will pay ſufficient attention to the operations of his own mind, will find that he *thinks* as well as *ſpeaks* in ſome language; and that in cogitation he ſuppoſes and runs over, ſilently and habitually, thoſe ſounds which in ſpeaking he actually utters (B). If this be ſo, it is impoſſible that a man without ſome effort ſhould ever ſpeak any thing but truth: for the *ideas* of what he has ſeen or heard, &c. are not of his manufacture;

(B) This ſeems to have been *Plato's* opinion; for he calls *thinking* [illegible], "the language by which the ſoul explains itſelf to itſelf when it conſiders any thing." And *Plotinus* ſays, [illegible], "the vocal words are an imitation of thoſe of the ſoul." To ſay that vocal words are an imitation of thoſe of the ſoul, is to ſpeak inaccurately, and to reverſe the proceſs of aſſociation; but it affords ſufficient evidence, that in the opinion of Plotinus men think as well as ſpeak in words.

Of Teſtimony.

nufacture; they are generated by external objects; and till they be effaced from the memory, they muſt always, by the law of aſſociation, make their appearance there with all their mutual relations, and in their proper dreſs. In the very act of learning to ſpeak, we neceſſarily learn to ſpeak the *truth:* for were we not to employ words exactly as they are employed by thoſe with whom we converſe, our language (if language it might be called) would be unintelligible; and we could neither declare our wants nor aſk relief with any hopes of ſucceſs. *Children* beginning to ſpeak, may indeed utter untruths without any motive, and merely from miſtake; becauſe the ideas and words of children have neither been long nor cloſely aſſociated: but it is impoſſible that a *man*, however wicked, ſhould habitually and without motives lie on ordinary occaſions, unleſs the fundamental principles of his nature have been totally altered; unleſs his brain has been diſordered by diſeaſe; unleſs his ideas have been diſarranged, and all his original aſſociations broken.

We know indeed by woful experience, that immoral men occaſionally utter falſehoods with a view to deceive. But on theſe occaſions they are influenced by ſome motive either of hope or terror: the falſehood is always uttered with an effort: and ſo ſtrong is the aſſociation between words and ideas, that the truth will at times break out in ſpite of all their endeavours to ſuppreſs it; ſo that the end or middle of a falſe narrative, if it be of any length, is commonly inconſiſtent with the beginning. We entertain a ſuſpicion concerning any matter of fact, when thoſe who relate it contradict each other—when they are but few in number, or of doubtful character—when they have an intereſt in what they affirm—when they deliver their teſtimony with heſitation—or, on the contrary, with too violent aſſeverations; becauſe theſe are circumſtances which we have generally experienced to accompany falſe witneſs. It is likewiſe with reluctance that we admit a narrative of events entirely different from every thing which hitherto we have ſeen or heard; becauſe we may not be certain that the narrator is not under ſome influence to deceive us in matters concerning which we have nothing but his teſtimony on which to ground our judgment. But in every caſe where the fact recorded is in itſelf poſſible, and attributed to an adequate cauſe; where a competent (c) number of witneſſes had ſufficient means of information, and are certainly under no inducement to deceive; teſtimony is complete evidence, however extraordinary the fact may be; becauſe no fact which is known to have an adequate cauſe can be ſo incredible, as that a number of men of ſound underſtandings ſhould act contrary to the fundamental principles of human nature, or be able, if ſo diſpoſed, to diſſolve aſſociations which had been formed in the mind of each from his infancy, and form new ones, all agreeing exactly with one another, but all contrary to truth.

Part II. Of BODY with its ADJUNCTS.

Chap. I. *Of the* Composition *of* Bodies; *or, of* Matter *and* Form.

HITHERTO we have contemplated only the powers of our own minds by which we acquire a ſtock of ideas, and the various operations of the intellect upon thoſe ideas, as treaſured up in the memory or imagination. In the courſe of the inquiry we have found, that every idea and notion which we have was ſuggeſted by ſomething independent of us; and in order to diſcover what thoſe things are, we have inveſtigated the nature of each ſenſe, as it is by the ſenſes only that we have any communication with the external world. By touch we perceive heat and cold, hardneſs and ſoftneſs, figure, ſolidity, motion, and extenſion; by the organ of ſmell, we perceive odours; by the tongue and palate, taſtes; by the ear, ſounds; and by the ſight, colours. We have likewiſe ſeen, that heat and cold, odours, taſtes, ſounds, and colours, are mere ſenſations which have no exiſtence but while they are perceived. On the other hand, hardneſs and ſoftneſs, figure and ſolidity, motion and extenſion, are neither ſenſations, nor like ſenſations; but are conceived to be ſomething external and independent of us, and to be the cauſes of certain ſenſations. Even of heat and cold, odours, taſtes, ſounds, and colours, we know with certainty that there is ſome cauſe independent of our faculties, which may operate in a deſart wilderneſs as well as in a populous city, though, for want of ſentient beings to operate upon, it cannot in the wilderneſs produce the ſame effects as in the city.

139 Of things perceived by the ſenſes the greater part always united.

Of things perceived by the ſenſes we find the greater part always united; for when a man perceives a piece of ſealing-wax, if he makes uſe of all his ſenſes, he perceives at once cold, taſte, colour, hardneſs, roughneſs or ſmoothneſs, figure, ſolidity, motion or reſt, and extenſion. That the powers or qualities, which in this inſtance produce the ſenſations of heat or cold, taſte, odour, and colour, are ſo united to the hardneſs, figure, ſolidity, and extenſion of the wax, as that they cannot exiſt alone, is evident; becauſe it is impoſſible to remove any one of theſe things, or to conceive it removed, without removing with it all the reſt.

(c) Should it be aſked what number we call competent, we beg leave to ſay, that it will be greater or leſs according to circumſtances. In caſes where they are not liable to the deceptions of ſenſe, two men of integrity and intelligence deſerve equal credit with two thouſand; but where there is particular occaſion for good organs, whether of ſight, hearing, or touch, the greater the number the greater is our ſecurity. To this muſt be added, that as one man is influenced by that which to another would be no motive, a great number of witneſſes concurring in the ſame teſtimony is always an additional ſecurity that they are not under the influence of any latent bias.

reſt. What then is the bond of this union? Do theſe things neceſſarily accompany one another, ſo as that one of them cannot exiſt without bringing all the reſt along with it? No; there is no neceſſary connection among them: for by the operation of fire the wax may be rendered liquid, when the *hardneſs* and *cold* are gone, tho' every thing elſe remains the ſame, or nearly the ſame, as it was before. By a ſtill further operation of fire the appearance may be entirely changed; and that which was formerly a piece of hard red wax, may be reduced to ſmoke and aſhes, in which there is neither hardneſs, colour, odour, nor figure; at leaſt there is not in the ſmoke and aſhes *ſuch* hardneſs, colour, odour, or figure, as was in the wax. The ſolidity and extenſion, however, remain; for we perceive aſhes and ſmoke to be extended and ſolid as much as wax or an adamant; nor is it poſſible to do any thing with the wax, or with any other ſenſible object, which ſhall deprive it of extenſion or ſolidity.

10 Thus, then, extenſion and ſolidity may exiſt and be perceived when ſeparated from hardneſs, colour, and odour; but none of theſe can exiſt, or be conceived to exiſt, independent of extenſion and ſolidity. Hardneſs, colour, odour, taſte, and figure, or the things which ſuggeſt theſe notions to us, have with great propriety been termed accidents or qualities; becauſe they cannot exiſt or be conceived to exiſt by themſelves, but require for their ſupport one common ſubject. Extenſion and ſolidity can exiſt independent of them, but they cannot exiſt independent of ſolidity and extenſion.

11 Is then ſolidity the baſis of theſe qualities, ſo that they neceſſarily reſult from it? No; there are many things ſolid and extended which are neither hard, nor coloured, nor odorous, nor ſapid; which could not be if theſe qualities were the neceſſary effect of ſolidity. Beſides, all mankind conceive of ſolidity and extenſion as qualities of ſomething elſe; for we never ſay that ſolidity is extended or coloured, or hard or odorous, but that ſomething ſolid has theſe qualities: whence it is evident that we conſider ſolidity as a quality itſelf. In what then does ſolidity and all the other ſenſible qualities inhere, ſince they cannot exiſt ſeparately, and do not ſupport each other? This is a queſtion which modern philoſophers pretend not to anſwer: but ſome of the ancients were not ſo modeſt. Ariſtotle and his followers reſolved every bodily ſubſtance into *matter* and *form*, making matter the baſis or *ſubſtratum*, and under form comprehending all ſenſible qualities.

As attempts have been lately made to revive this philoſophy, it may not be improper to give a ſhort view of the doctrine of *matter* and *form*, if it were only to diſcover whether the ſpeculations of Ariſtotle and his adherents on this ſubject deſerve to be preferred to thoſe of Newton and Locke.

The moſt perſpicuous, and by far the moſt elegant writer among the moderns who has adopted the ancient philoſophy, is Mr Harris; and leſt we ſhould be accuſed by others of doing injuſtice to a ſubject above the reach of ordinary comprehenſion, we ſhall tranſcribe ſo much of what he has ſaid of *matter* and *form* in his philoſophical arrangements as ſeems neceſſary to make our readers underſtand his meaning as far as it is intelligible.

Of the Compoſition of Bodies.

142 The Peripatetic doctrine concerning matter;

"Matter (ſays this writer) is that elementary conſtituent in compoſite ſubſtances which appertains in *common* to them all, without diſtinguiſhing them from one another. Every thing generated or made, whether by nature or art, is generated or made out of ſomething elſe; and this ſomething elſe is called its ſubject or matter. Such is iron to the ſaw; ſuch is timber to the boat. Now this *ſubject* or *matter* of a thing being *neceſſarily previous* to that thing's exiſtence, is *neceſſarily different* from it, and *not the ſame*. Thus iron, as iron, is not a ſaw; and timber, as timber, is not a boat. Hence, then, one character of every *ſubject* or *matter*, that is, the character of *negation* or *privation*. [He means *negation* or privation of what is to be made out of it.]

143 Which is deſcribed as deſtitute of every attribute or quality,

"Again, though the *ſubject* or *matter* of a thing be not that thing, *yet*, were it incapable of becoming ſo, it could not be called its ſubject or matter. Thus iron is the *ſubject* or *matter* of a ſaw; becauſe, though *not* a ſaw, it may ſtill *become* a ſaw. On the contrary, timber *is not* the ſubject or matter of a ſaw; becauſe it not only (as timber) is no ſaw, but can never be made one from its very nature and properties. Hence, then, beſides *privation*, another character of every *ſubject* or *matter*, and that is the character of *aptitude* or *capacity*. [He means aptitude or capacity to be that which is made out of it.]

"Again, when one thing is the *ſubject* or *matter* of *many* things, it implies a *privation* of them *all*, and a *capacity* to them *all*. Thus iron being the ſubject or matter of the ſaw, the axe, and the chiſſel, implies *privation* and *capacity* with reſpect to *all three*. Again, we can change a ſaw into a chiſſel, but not into a boat; we can change a boat into a box, but not into a ſaw. The reaſon is, there can be no change or mutation of one thing into another where the two changing beings do not participate the ſame matter (D). But even here, were the boat to moulder and turn to earth, and that earth by natural proceſs to metalliſe and become iron; through ſuch progreſſion as this we might ſuppoſe even the boat to become a ſaw. Hence therefore it is, that *all change* is by immediate or mediate participation of the *ſame matter*. Having advanced thus far, we muſt be careful to remember, firſt, that every *ſubject* or *matter* implies, as ſuch, *privation* and *capacity*; and next, that *all change* or *mutation* of beings into one another is *by means of their participating the ſame common matter*. This we have choſen to illuſtrate from works of art, as falling more eaſily under human cogniſance and obſervation. It is, however, no leſs certain as to the productions of nature, though the ſuperior ſubtlety in theſe renders examples more difficult. The queſtion then is, whether in the world which we inhabit, it be not admitted from experience, as well as from the confeſſion of all philoſophers, that ſubſtances

(D) In a note he ſays: This reaſoning has reference to what the ancients called υλη προσεχης, *the immediate matter*, in oppoſition to υλη πρωτη, *the remote* or *primary matter*.

Of the Compoſition of Bodies.

ſubſtances of every kind (E), whether natural or artificial, either immediately or mediately, paſs into one another; and whether, in that caſe, there muſt not be ſome one *primary matter* common to *all things*. I ſay ſome *one primary matter*, and that common to *all things*, ſince without ſome *ſuch* matter, *ſuch mutation* would be wholly impoſſible. But if there be ſome *one primary matter*, and that *common to all things*, this *matter* muſt imply, not (as particular and ſubordinate matters do) a *particular* privation and a *particular* capacity, but, on the contrary, *univerſal* privation and *univerſal* capacity. If the notion of ſuch a being appear ſtrange and incomprehenſible, we may farther prove the *neceſſity* of its exiſtence from the following conſiderations: Either there is no ſuch general change as here ſpoken of; which is contrary to fact, and would deſtroy the ſympathy and congeniality of things: Or, if there be, there muſt be a matter of the character *here* eſtabliſhed; becauſe without it (as we have ſaid) ſuch change would be *impoſſible*. Add to this, however hard *univerſal* privation may appear, yet had the *primary matter*, in its proper nature, any one particular attribute, ſo as to prevent its *privation* from being unlimited and univerſal, ſuch *attribute would run through all things*, and be conſpicuous in all. If it were white, all things would be white; if circular, they would be circular; and ſo as to other attributes; which is contrary to fact. Add to this, that the *oppoſite* to ſuch attribute could *never* have exiſtence, unleſs it were poſſible for the ſame thing to be at *once* and in the ſame inſtance both white and black, circular and rectilineal, &c. ſince this inſeparable attribute would neceſſarily be *every where*; becauſe the *matter*, which implies it, is itſelf *every where*, at leaſt may be found in all things that are generated and periſhable.

144 And to be apprehended only by abſtraction and analogy.

"Here then we have an idea (ſuch as it is) of that ſingular being ὕλη πρώτη, the *primary matter*; a being which thoſe philoſophers who are immerged in ſenſible objects know not well how to admit, though they cannot well do without it; a being which flies the perception of every *ſenſe*, and which is at beſt, even to the *intellect*, but a negative object, no otherwiſe *comprehenſible* than either by *analogy* or *abſtraction*. We gain a glimpſe of it by *abſtraction*, when we ſay that the *firſt matter* is *not* the lineaments and complexion which make the beautiful face; *nor yet* the *fleſh* and *blood* which make thoſe lineaments and that complexion; *nor yet* the liquid and ſolid aliments which make that fleſh and blood; *nor yet* the ſimple bodies of earth and water which make thoſe various aliments; but *ſomething*, which being *below* all theſe, and ſupporting them all, is yet *different* from them all, and eſſential to their exiſtence. We obtain a ſight of it by *analogy*, when we ſay, that as is the braſs to the ſtatue, the marble to the pillar, the timber to the ſhip, or any one *ſecondary matter* to any one *peculiar form*; ſo is the *firſt* and *original matter* to all *forms in general*."

Such is the doctrine of the Peripatetics concerning the *primary matter*, or the baſis of bodily ſubſtances. We forbear to make any remarks upon it till we have ſeen what they ſay of *form*, the other eſſential part of every body; for what is meant by *matter* and *form* will be moſt completely ſeen when they are viewed together.

145 The peripatetic doctrine concerning form.

"FORM (ſays the ſame elegant writer) *is that elementary conſtituent in every compoſite ſubſtance, by which it is* DISTINGUISHED, *and* CHARACTERISED, *and known, from every other*. But to be more explicit: The *firſt* and moſt ſimple of all *extenſions* is a *line*: this, when it exiſts, united with a *ſecond* extenſion, makes a *ſuperficies*; and theſe two, exiſting together with a *third*, make a *ſolid*. Now this *laſt* and *complete* EXTENSION we call the *firſt* and *ſimpleſt* FORM; and when this *firſt* and *ſimpleſt form* accedes to the *firſt* and *ſimpleſt matter*, the union of the two produces *body*; which is for that reaſon defined to be *matter triply extended*. And thus we behold the riſe of *pure* and original *body* (F). It muſt be remembered, however, that *body*, under this character, is ſomething *indefinite and vague*, and ſcarcely to be made an *object* of *ſcientific contemplation*. It is neceſſary to this end that its extenſion ſhould be *bounded*; for as yet we have treated it without ſuch regard. Now, the *bound* or *limit* of *ſimple body* is *figure*; and thus it is that *figure*, with regard to *body*, becomes the next *form* after *extenſion*.

146 The three original forms which, [...]ed to matter, constitute body physical.

"But though the *boundary* of body by *figure* is one ſtep towards rendering it *definite* and *knowable*, yet is not this ſufficient for the purpoſes of nature. It is neceſſary *here*, that not only its *external* ſhould be duly bounded, but that a ſuitable regard ſhould likewiſe be had to its *internal*. This *internal adjuſtment*, diſpoſition, or *arrangement* (denominate it as you pleaſe), is called ORGANIZATION, and may be conſidered as the *third* form which appertains to body. By its acceſſion we behold the riſe of BODY PHYSICAL or NATURAL; for every ſuch body is ſome way or other *organized*. And thus may we affirm, that theſe *three*, that is to ſay, *extenſion*, *figure*, and *organization*, are the *three original forms* to *body phyſical* or *natural*; *figure* having reſpect to its *external*, *organization* to its *internal*, and *extenſion* being common both to one and to the other. It is more than probable, that from the variation in theſe *univerſal* and (as I may ſay) *primary forms*, ariſe moſt of thoſe *ſecondary* forms uſually called *qualities ſenſible*, becauſe they are the proper objects of our ſeveral ſenſations. Such are roughneſs and ſmoothneſs, hardneſs and ſoftneſs; the tribes of colours, ſavours, odours; not to mention thoſe powers of character more *ſubtle*, the powers electric, magnetic (G), medicinal, &c.

(E) He muſt mean only bodily ſubſtances; for it is not admitted by ſuch philoſophers as make a diſtinction between mind and body, that the one ever paſſes into the other.

(F) "Original body (he ſays), when we look *downward*, has reference to the *primary matter*, its ſubſtratum: when we look *upwards*, it becomes itſelf a *matter* to *other things*; to the *elements*, as commonly called, air, earth, water, &c. and in conſequence to all the variety of *natural productions*."

(G) That it is from the *extenſion*, *figure*, and *organization* of bodies, that their *medicinal* powers ariſe, ſeems to be undeniable; for medicines operate by contact: but it is not ſo clear that the ſame *forms*, to uſe the author's language, are the ſource of *magnetical* powers. If the magnet be ſurrounded with an atmoſphere extending to a certain diſtance, ſuch may be the caſe; but if not, the author's conjecture muſt be ill founded. See MAGNETISM.

Of the Composition of Bodies.

"Here therefore we may anſwer the queſtion, how *natural* bodies are *diſtinguiſhed*. Not a ſingle one among them conſiſts of *materia's in chaos*, but of materials wrought up after the moſt exquiſite manner, and that conſpicuous in their *organiſation*, or in their *figure*, or in *both*.—As therefore every *natural body* is diſtinguiſhed by the *differences* juſt deſcribed, and as theſe *differences* have nothing to do with the *original matter*, which being every where ſimilar can afford no diſtinction at all; may we not here infer the expediency of ESSENTIAL FORMS, that every *natural ſubſtance* may be eſſentially *characteriſed?* Theſe *forms*, though they differ from matter, can yet *never ſubſiſt without it;* but *united* with it, they help to produce every *compoſite* being, that is to ſay, in other words, every *natural ſubſtance*, in the viſible world. It muſt be remembered, however, that it is the FORM in this union which is the *ſource of all diſtinction*. It is by *this* that the *ox* is diſtinguiſhed from the *horſe*, not by that graſs on which they ſubſiſt, the *common matter* to both. To which alſo may be added, that as figures and ſenſible qualities are *the only objects of our ſenſations*, and theſe are all *parts* of *natural form;* ſo therefore (contrary to the ſentiment of the vulgar, who dream of nothing but of matter) *it is form, which is in truth the whole that we either hear, ſee, or feel;* nor is *mere matter* any thing better than an *obſcure imperfect being*, knowable only to the *reaſoning faculty* by the two methods already explained, I mean that of *analogy* and that of *abſtraction*. Here therefore we conclude with reſpect to *ſenſible forms*, that is to ſay, *forms immerged in matter* and *ever inſeparable* from it. In *theſe* and *matter* we place the ELEMENTS OF NATURAL SUBSTANCE."

If this extract appear long, let it be remembered that it contains the fulleſt and moſt perſpicuous detail which is to be found in the Engliſh language, of a doctrine of which the author of *Ancient Metaphyſics* ſuppoſes Locke to have been ignorant; and for which ignorance he affects to treat the Engliſh philoſopher with ſupercilious contempt. Had Locke really been ignorant of the ancient doctrine of *matter* and *form*, it is probable that moſt people will be of opinion that the *contempt* expreſſed by his cenſurer might have been ſpared; but if it ſhould appear, that, as far as this theory is intelligible, it differs not, except in words, from the doctrine laid down in the *Eſſay concerning human underſtanding*, what ſhall we think of that zeal for ancient phraſes, which had influence ſufficient to make one reſpectable philoſopher pour contempt upon another who was an ornament to his country?

147
Matter cannot be deſtitute of ſolidity.

What Mr Harris has ſaid of *matter* and *form* reſpecting works of art, is ſufficiently intelligible, and extremely juſt. Nor ſhould we object to the account which he gives of the origin of natural body, if he had not diveſted his firſt matter of every power and every quality, ſolidity and extenſion not excepted. But though we can ſuppoſe body diveſted of any one particular figure and of every ſenſible quality, ſuch as colour, odour, taſtes, &c. and the *ſubſtratum* or *baſis* or *matter* of it ſtill to remain, yet it ſeems impoſſible to conceive it diveſted of *ſolidity* without ſuppoſing it totally annihilated. Nay, if we have any juſt notion at all of ſolidity, it is evidently inſeparable from the ſubſtratum of body, whatever that ſubſtratum be; and indeed, though Mr Harris diveſts his firſt matter of every attribute, the argument by which he proves the neceſſary exiſtence of ſuch a being does not require its privation to be ſo univerſal. "Had the *primary matter* (ſays he), in its proper nature, any one particular attribute, ſo as to prevent its privation from being unlimited and univerſal, *ſuch attribute would run through all things* and be conſpicuous in all." This indeed is obvious and undeniable: but *ſolidity* and *extenſion* do in *fact* run through *all things* into which the *ſubſtratum* or *matter* of body is ever formed or ever can be conceived to be formed; and therefore there is no neceſſity for ſuppoſing the firſt matter diveſted of theſe attributes (H).

Mr Harris ſays, that both Timæus and Plato drop ex-

(H) Nor does it appear that it was diveſted of them by all the ancient philoſophers. We learn from Cudworth, that "the atomical phyſiology, the moſt ancient perhaps of any, teaches that body is nothing elſe but μεγεθος αντιτυπον, *extended bulk;* and that nothing is to be attributed to it but what is included in the nature and idea of it, viz. greater or leſs magnitude with diviſibility into parts, figure, and poſition, together with motion or reſt, but ſo as that no part of body can ever move itſelf. And conſequently, this philoſophy ſuppoſes, that there is no need of any thing elſe beſides the ſimple elements of magnitude, figure, ſite, and motion (which are all clearly intelligible, or different modes of extended ſubſtance), to ſolve the corporeal phenomena by; and therefore not of any ſubſtantial *forms* diſtinct from the matter; nor of any other qualities really exiſting in the bodies without, beſides the reſults or aggregates of thoſe ſimple elements, and the diſpoſition of the inſenſible parts of bodies in reſpect of figure, ſite, and motion; nor of any intentional *ſpecies* or *ſhows* propagated from the objects to our ſenſes; nor, laſtly, of any other kind of motion or action really diſtinct from local motion (ſuch as generation and alteration), they being neither intelligible as modes of extended ſubſtance, nor any way neceſſary: Foraſmuch as the forms and qualities of bodies may well be conceived to be nothing but the reſult of thoſe ſimple elements of magnitude, figure, ſite, and motion, variouſly compounded together; in the ſame manner as ſyllables and words in great variety reſult from the different combinations and conjunctions of a few letters, or the ſimple elements of ſpeech; and the corporeal part of ſenſation, and particularly that of viſion, may be ſolved only by local motion of bodies; that is, either by corporeal effluvia (called *ſimulacra*, *membranæ*, and *exuviæ*), ſtreaming continually from the ſurface of the objects, or rather, as the later and more refined atomiſts conceived, by preſſure made from the object to the eye, by means of light in the medium. So that ως δια βακτηριας του τασιν, αερος το βλεπομενον αναγγελλεται, the ſenſe taking cognizance of the object by the ſubtile interpoſed medium, that is tenſe and ſtretched (thruſting every way from it upon the optic nerves), doth by that, as it were by a ſtaff, touch it. Again, generation and corruption may be ſufficiently explained by concretion and ſecretion, or local motion, without ſubſtantial forms and qualities expreſſions as if they conſidered *matter* to be *place;* but place, as will be ſeen afterwards, can be the baſis of nothing. He likewiſe quotes a paſſage from Ammonius on the predicaments, in which it is ſaid "that there never was in *actuality* either matter without body, or body without quality;" and we appeal to our readers if it be not abſolutely impoſſible to contemplate ſuch a being even in *idea*. To the queſtion, Whether the firſt matter has a ſeparate exiſtence by itſelf, diſtinct from all the qualities of body, the author of *Ancient Metaphyſics* anſwers thus:—"We have no idea of it exiſting ſeparately, becauſe we find no ſuch thing in nature, from which we draw all our ideas; but whether there may not be ſuch a thing exiſting in the regions of infinite ſpace, as *matter* without *form* and *dimenſions*, is what I think no man can take upon him to decide." But with all ſubmiſſion, if a man cannot decide this queſtion with the utmoſt certainty, his three ponderous volumes are nothing better than uſeleſs paper: for the ſubject of them is things *exiſting;* and concerning exiſtence we know nothing with greater certainty, than that a being of which nothing poſitive can be affirmed, cannot poſſibly have any exiſtence.

148 Some firſt matter common to all bodies.

That, in the world which we inhabit, bodily ſubſtances of every kind, whether natural or artificial, either immediately or mediately paſs into one another, is a truth which cannot be denied; and therefore it follows, that there muſt be ſome one primary matter common to all things. In modern philoſophy this primary matter is conſidered as ſolid, and as the *ſubſtratum* of all bodies; and all thoſe things which, in the language of Mr Harris, are comprehended under the appellation of *form*, are called *qualities:* ſo that on this ſubject the ancient and modern philoſophy differ in nothing but in the latter uſing the word *qualities* inſtead of the word *form;* and defining the firſt matter to be a "*ſolid* ſubſtance every where the ſame," whilſt the ancient philoſophy conſiders it as void of ſolidity.

149 Of the nature of which men are equally ignorant.

Of the nature of this firſt matter all philoſophers are equally ignorant: for, as Mr Harris ſays, it is in truth *form;* or, as modern philoſophers would ſay, they are in truth *qualities*, which are the whole that we either hear, or ſee, or feel, or of which we have either idea or conception. Mr Locke ſays expreſsly, "That if any one will examine himſelf concerning his notion of pure ſubſtance in general, he will find that he has no other idea of it at all, but only a ſuppoſition of he knows not what ſupport of ſuch qualities as are capable of producing ſimple ideas in us."

150 How we know that the things immediately perceived are qualities.

But how, it has been aſked, do we know that the things which we perceive are qualities, and cannot exiſt without a ſubject? We anſwer, Becauſe every one of them, except ſolidity, may be changed or deſtroyed, and the ſubject in which they inhere ſtill remain. Thus, though wax may be melted or burnt, and be no longer a hard red ſubſtance of ſuch a figure and ſuch a ſmell, the matter which ſupported the hardneſs, figure, colour, and ſmell, ſtill remains; for melted wax or aſhes is as much a ſolid ſubſtance as is that which may be uſed for the ſealing of letters, &c.

It has been ſaid that ſolidity (1) is the *ſubſtratum* of

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lities. And laſtly, thoſe ſenſible ideas of light and colours, heat and cold, ſweet and bitter, as they are diſtinct things from the figure, ſite, and motion of the inſenſible parts of bodies, ſeem plainly to be nothing elſe but our own fancies, paſſions, and ſenſations, however they be vulgarly miſtaken for qualities in the bodies without us." *Cudworth's Intellectual Syſtem*, Book i. chap. 1.

This, as will be ſeen by and by, is the philoſophy of Newton, Locke, and all their followers: and that it is the genuine philoſophy of the ancient atomiſts, we may ſafely take the word of the author whom we have quoted; for no modern has been more converſant with their writings, more completely maſter of their language, or has given their ſenſe with greater accuracy. Thoſe authors, therefore, who in their zeal for ancient metaphyſics would explode the phyſiology of Newton and Locke, and ſubſtitute in its place the Ariſtotelian doctrine of *matter* and *form*, belie their own pretences; for the theory which they would baniſh is more ancient than that which they wiſh to introduce; and we appeal to our readers if it be not more intelligible.

(1) The philoſophers of moſt eminence who have maintained this opinion are, *Dr Watts;* the author of the *Procedure, Extent, and Limits, of the Human Underſtanding*; and *Dr Law* late biſhop of Carliſle, who in a note upon *King's origin of evil* gives the opinion of the triumvirate in the following words:—"We find by experience, that a thing will always exhibit the ſame appearances in ſome reſpects, though it admit of changes in others: or, in Mr Locke's language, that certain numbers of ſimple ideas go conſtantly together, whereas ſome others do not. The former of theſe we call the *ſubſtance*, thing, or being, itſelf; the latter are termed its modes or *accidents*. Thus the ſubſtance of *body*, as far as we know of it, conſiſts in ſolidity and extenſion; which being neceſſarily finite, it alſo becomes capable of diviſion, figure, and motion. Theſe are its original inſeparable qualities, which conſtitute the thing, and ſeem not to depend on any thing elſe as a *ſubject*. But a particular figure, motion, &c. are only accidents or modes of its exiſtence; which do not neceſſarily attend it, though they themſelves cannot be ſuppoſed to exiſt without it. The ſubſtance of *ſpirit* conſiſts in the powers of thinking and acting, which likewiſe admit of various modifications. This ſeems to be all that we can learn concerning the nature of things from obſervation and experience. To inquire into the *manner* how theſe, which we call *properties*, exiſt together, or to attempt to explain the *cauſe*, ground, or reaſon, of their union, is in vain. To aſſign the word *ſubſtance* for a repreſentation of it, is ſaying nothing: it is ſetting a mere word for what we have neither any idea of nor occaſion for. Indeed if we conſider theſe primary qualities as needing ſomething to inhere in, we are obliged to ſeek for ſomething to ſupport them: and by the ſame way of reaſoning, we may ſeek for ſomething elſe to ſupport that other ſomething, and ſo on; and at laſt ſhall find no other ſupport for the whole but the cauſe which produced it." "Dr Watts (continues the biſhop) is of opinion, that it is introducing a needleſs *ſcholaſtic* notion into the real nature of things, and then fancying it to have a real exiſtence;" (*Logic*, p. 14.) The author of the *Procedure, Extent*, &c. affirms, "That as far as we directly know the eſſential properties of any ſubſtance, ſo far we have a *direct* knowledge of the ſubſtance

[Of the Compoſition of Bodies.] of body; and men have been probably led into this notion from a conviction that ſuch *ſubſtratum*, whatever it be, is and muſt be ſolid; but that ſolidity is only a quality inſeparable from the firſt matter, and not that matter itſelf, muſt be evident from this conſideration, that ſolidity is the ſame in all bodies, and incapable of producing by itſelf any other effect than that of excluding from the place occupied by it every other ſolid ſubſtance. It could not of itſelf be the *ſubſtratum* of colour, taſte, or ſmell, otherwiſe all bodies would be coloured, ſapid, and odorous; and as, according to all our notions of it, it is incapable of any change, it could not by itſelf be ſo modified as to excite in us theſe ſenſations.

151 [Our] notion [of m]atter [relat]ive and [obſc]ure.

The things then immediately perceived by us, or of which we have any adequate idea or conception, are only qualities which muſt belong to a ſubject; and all that we know about this ſubject is, that it is that to which ſuch qualities belong. From this it is evident, that our notion of matter, as diſtinguiſhed from its qualities, is a relative § and obſcure notion, and muſt remain obſcure till men have other faculties. In this the philoſopher ſeems to have no advantage above the vulgar: for as they perceive colour, and figure, and motion, by their ſenſes, as well as he does; and as both are equally certain that there is a ſubject of thoſe qualities; ſo the notions which both have of this ſubject are equally obſcure; or, to ſpeak more properly, they have no *poſitive* notion of it all. When a philoſopher calls it the *firſt matter*, a *ſubſtratum* or a *ſubject* of *inheſion*, thoſe learned words convey no meaning but what every man underſtands and expreſſes, by ſaying in common language, that it is a thing extended, ſolid, and moveable.

[§ Reid's Eſſays on Intellectual Powers of Man.]

They are therefore *qualities*, or in the language of ancient philoſophy, *forms* alone, about which, in corporeal ſubſtance, we can reaſon with preciſion and certainty; and it is ſufficient for all the purpoſes of life that we have of them an adequate knowledge. For as the *firſt matter* or original *ſubſtratum* of all bodies ſeems to be the ſame, though we know not what it is; and as one body is diſtinguiſhed from another only by its *qualities* or *powers*: a knowledge of the nature of theſe is all that can be neceſſary to direct our conduct with reſpect to the various objects with which we are ſurrounded.

152 [Qua]lities, [prim]ary.

Qualities thus conſidered in bodies, are, firſt, ſuch as are utterly inſeparable from the body, in what ſtate ſoever it is; ſuch as in all the changes and alterations which it ſuffers, and under all the force which can be employed upon it, it conſtantly keeps. Thus, in the inſtance already given, a ſtick of ſealing-wax may, by the operation of fire, be rendered liquid or reduced to ſmoke and aſhes; and when it has undergone theſe changes, it has loſt many of the ſenſible qualities which it had when a long round ſubſtance fit for the purpoſe of ſealing letters; but other qualities which were then perceivable in it ſtill remain: for not only liquid wax, but every particle of ſmoke and aſhes, is ſolid and extended, as well as the hardeſt or largeſt body; and every ſuch particle has likewiſe ſome figure, and is capable of motion or reſt. Again, if a grain of wheat or any other corporeal ſubſtance be divided into two parts, and each part be again divided without end, ſtill the ſmalleſt particle of it will be ſolid, extended, of ſome figure, and capable of further diviſion. *Solidity*, *extenſion*, *diviſibility*, and *motion* or *reſt*, are therefore qualities inſeparable from *body*, and have on that account been with great propriety called its *original* or *primary qualities*.

153 Secondary.

There are other qualities, which in truth are nothing in the bodies themſelves, but powers ariſing from the magnitude, figure, texture, and motion, of their inſenſible parts, to produce in us various ſenſations; ſuch are *colours*, *ſounds*, *taſtes*, and *odours*. Theſe have been denominated *ſecondary qualities*: and to them may be added a third ſort, which are univerſally allowed to be barely *powers*, though they are in fact as much real qualities in the ſubject as thoſe we have juſt mentioned. Thus the power in fire to produce by its primary qualities a new colour or conſiſtency in wax or clay, is as much a quality in the fire as the power which it has to produce in us a new ſenſation of warmth or burning. That *colours*, *taſtes*, *ſounds*, and *odours*, as they are perceived by us, are mere ſenſations, has been already proved: and that the powers in the bodies which produce theſe ſenſations are not, like *ſolidity* and *extenſion*, inſeparable from the body to which they may belong, is evident; becauſe a piece of *red* wax may be reduced to *black* aſhes; and becauſe by pounding an almond we may change its clear white colour into a dirty hue, and its pleaſant taſte into one that is oily and rancid; and a ſingle rent through the body of a bell deſtroys its ſound.

The primary qualities of body have a real exiſtence, independent of us and of every other creature. Thus the particular *bulk*, *number*, *figure*, and *motion*, of the *parts* of *fire* or *ſnow* are *really in the fire or ſnow*, whether any man's ſenſes perceive them or not; and therefore theſe may be called *real qualities*, becauſe they really exiſt in the bodies: But *light*, *heat*, *whiteneſs*, or *cold* (as they are perceived by us), are no more *really in fire or ſnow*, than ſickneſs is in *tartar* or pain in a *ſword*. Take away the ſenſations of them: let not the eyes ſee light or colours, nor the ears hear ſounds; let not the palate taſte nor the noſe ſmell; and all colours, taſtes, odours, and ſounds, as they are ſuch particular ſenſations, vaniſh and ceaſe, and are reduced to their cauſes, *i. e.* to the bulk, figure, and motion of the parts of the body.

154 Bodily qualities are of three ſorts.

The qualities then that are in bodies, rightly conſidered, are of three ſorts. 1. The *bulk*, *figure*, *number*, *ſituation*,

ſubſtance *itſelf*: and if we had a direct knowledge of *all* the eſſential properties of any ſubſtance, we ſhould have an *adequate* knowledge of that ſubſtance; for ſurely, if there be any meaning in words, the knowing any thing of the eſſential properties of a thing is knowing *ſo much* of its very ſubſtance."

That the ſubſtance of body conſiſts in *ſolidity* and *extenſion*, and nothing more; and that theſe depend not upon any thing elſe as a *ſubject*; cannot be true: for *ſolidity*, in our conception, is nothing but *impenetrability*; but whoever uſes the word *impenetrability*, certainly means that there is *ſomething* impenetrable. That there is ſome real thing or being different from ſolidity and extenſion, which impreſſes us with the notion that it is ſolid and extended, is ſelf-evident to all mankind: if it be not matter, theſe conceptions muſt be communicated

Of the Constitution of Bodies.

situation, and *motion* or *rest*, of their *solid* parts. Of these, as they are in themselves, we have clear and distinct notions. We know that they are in the body whether we perceive them or not, and we call them *primary* or *essential qualities*. 2. The power that is in any body, by reason of its internal texture and insensible primary qualities, to operate upon our senses in a peculiar manner, producing in us the different sensations of *colours*, *sounds*, *tastes*, or *smells*, &c. These we have called *secondary qualities*, but they are often termed *sensible qualities*. 3. The *power* that is in any body, by reason of the particular constitution of its primary qualities, to make such a *change* in the *bulk*, *figure*, *texture*, and *motion* of *another body*, as to make it operate on our senses differently from what it did before. Thus, the sun has a power to make wax white, and fire to make lead fluid. These are universally called *powers*; but we have no such notions of them as we have of the *primary qualities* of bodies. We know that they exist, but we know not what they are. It has indeed been discovered, that the sensation of smell is occasioned by the effluvia of bodies †; that of sound, by their vibration. The disposition of bodies to reflect a particular kind of light occasions the sensation of colour; and the operation of the minute parts of bodies upon the nerves of the tongue and palate is the cause of tastes. Very curious discoveries have been made of the nature of heat and its manner of operation, and an ample field still remains. We are likewise intuitively certain, that body can operate upon body only by impulse; but how certain impulses upon certain organs should produce sensations in us to which there is nothing similar in the impelling body, is equally unknown to the clown and the philosopher.

† *Reid's Essays on the Intellectual Powers of Man*, and *Locke's Essay*, &c.

155
The doctrine of the ancient atomists respecting qualities.

Such is the distinction which in modern philosophy is made between primary and secondary qualities; but it is a distinction which was likewise well known to that sect of ancient philosophers who were denominated *atomists*. At the head of these were Thales and Pythagoras (K); and we may infer from Aristotle, that the sect comprehended almost all the physiologists who taught before himself and Plato: for he says*, Δημοκριτος και οι πλειστοι των φυσιολογων ατοπωτατον τι ποιουσι, παντα γαρ τα αισθητα απτα ποιουσι, και εις σχηματα αναγουσι τους χυμους: "Democritus, and *most* of the *physiologists*, fall into a great absurdity; for they make all sense to be touch, and resolve sensible qualities into the figures of insensible atoms." And he adds, that "the former physiologists (without exception) said not well, that there is no black and white without the sight, nor bitter and sweet without the taste." He elsewhere § tells us, that those philosophers explained generation and alteration without forms and qualities, by figures and local motion." Δημοκριτος και Λευκιππος ποιησαντες τα σχηματα την αλλοιωσιν και την γενεσιν εκ τουτων ποιουσι, διακρισει μεν και συγκρισει γενεσιν και φθοραν, ταξει δε και θεσει αλλοιωσιν. "Democritus and Leucippus having made figures (or variously figured atoms) the first principles, make generation and alteration out of these; namely, generation together with corruption from the concretion and secretion of them, but alteration from the change of their order and position." By the atomic physiologists the name of *quality* was generally applied only to those things which we have called *secondary qualities*. The *primary* being considered as *essential* to *matter*, were seldom, if ever, called *qualities*. That the atoms, which they held to be the first principles of bodies, were figured, solid, extended, and moveable, is apparent, not only from the short view of their system which we have given from Cudworth, but likewise from the passages which we have just quoted from Aristotle: but the question debated between them and their antagonists was, whether those atoms had *smell*, *taste*, and *colour*; or, as it was commonly expressed, whether they had *qualities*? Democritus, Leucippus, and the other atomists, we see, maintained that they had not; and the following account of the doctrine of Protagoras, another philosopher of that school, shows, that on this subject at least the ancient advocates for the atomic system reasoned as justly as any of the moderns, and much more justly than the Peripatetics and Platonists by whom they were opposed. Plato having in his Theætetus first said in general that the philosophy of Protagoras made all things to consist of a commixture of atoms and local motion, represents his doctrine concerning colours in particular, after this manner: "First, as to that which belongs to the sight, you must conceive what is called a white or black colour, not to be any thing absolutely existing either without your eyes or within your eyes; but black and white, and every other colour, is caused by different motions made upon the eye, from objects differently modified; so that it is nothing either in the agent or patient absolutely,

* *Lib. de Sensu et Sensibili*, cap. 4.

§ *De Generatione et Corruptione*, lib. i. cap.

ated to us by the immediate agency of the Deity, which seems to have been the real opinion of the Bishop of Carlisle. But this differs not from the theory of Berkeley, which we shall consider by and by.

(K) This is denied by Bishop Warburton, who thinks nothing better settled than that Democritus and Leucippus were the authors of the atomic physiology. We highly respect the learning and ingenuity displayed in the Divine Legation of Moses; but on this point we are convinced that its author is mistaken. Strabo expressly affirms, that Moschus the Phenician was the author of the atomic physiology; and Cudworth has proved, by arguments which to us are perfectly satisfactory, that Thales and Pythagoras were both atomists, and that they derived the doctrine from Phœnicia or Egypt. They did not, indeed, speculate in physics, but delivered their doctrines as they had received them from tradition, and they referred all motion to mind as its cause. Leucippus and Democritus, we believe, were the first speculative atomists: but though they refined upon, and perhaps improved, the mere mechanical part of the physiology of their masters, they unhappily dropt the better part of it; and, banishing mind from their system of the universe, they became materialists and atheists. With the sober and pious part of philosophers this brought the atomic theory into disrepute, and Plato and Aristotle, who were theists, when they opposed that theory, always pointed their arguments against Leucippus and Democritus, which is probably what led the learned bishop to consider these atheists as the authors of the atomic physiology.

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solutely, but something which arises from between them both (L)." From this passage it is plain that Protagoras thought of colours exactly as Mr Locke thought, that they are not *real qualities* existing in bodies, but merely sensations excited in our minds; and indeed he is presently after represented as having called them τινα ιδια φασματα, *certain fancies* or *appearances in us*. But there is in the Theœtetus another passage, in which a fuller account is given of the atomic philosophy, to this purpose: "The principle upon which all these things depend is this, That the whole universe (M) is motion of atoms and nothing else; which motion is considered two ways, and is accordingly called by two names, *action* and *passion*. From the mutual congress, and, as it were, attrition of these together, are begotten innumerable offsprings, which, though infinite in number, yet may be reduced to two general heads, *sensibles* and *sensations*, which are both generated at the same time. The *sensations* are *seeing*, *hearing*, and the like; and the corresponding *sensibles* are *colours*, *sounds*, &c. Wherefore, when the eye and its proper object meet together, both the αισθητον and the αισθησις, the *sensible idea* of white and black, and the *sensation* of seeing, are generated together, neither of which would have been produced if those two had not met. The like is to be conceived of all other *sensibles*, as hot and cold, &c. None of these are absolute things in themselves, or real qualities in external objects; but they are begotten from the mutual congress of agent and patient, and that by motion. So that neither the agent has any such thing in it before its congress with the patient, nor the patient before its congress with the agent. But the agent and patient meeting together, and begetting *sensation* and *sensibles*, both the object and the sentient are forthwith made to be so and so qualified; as when honey is tasted, the sensation of tasting, and the quality of sweetness, are begotten together, though the sensation be vulgarly attributed to the taster, and the quality of sweetness to the honey." The conclusion of all which is summed up thus, ουδεν ειναι αυτο καθ αυτο, αλλα τινι αει γιγνεσθαι: "Not one of these sensible things is any thing absolutely in the object without, but they are all generated or made relative to the sentient (N)."

The language of ancient philosophy was defective in precision; terms were used vaguely and improperly, so that the meaning of the author is often to be collected only from the context. When Protagoras is here made to say, that when the agent and patient meet together, both the object and the sentient are forthwith made to be so and so *qualified*; as when honey is tasted, the sensation of tasting and the *quality* of sweetness are begotten together; it could not be his meaning, that any real change is made upon the external object merely by our tasting it, but only that the actual sensation and the sensible *idea* of sweetness are produced at once; just as he had said before, that the sensible idea of white or black, and the sensation of seeing, are generated together. If his words be thus interpreted, they express a noble truth; and the whole passage shows, that the ancient Atomic theory differed not from the theory of Des Cartes, Newton, and Locke, being the most rational as well as the earliest system of physics with which we have any acquaintance. By divesting body of *essential forms* distinct from matter and motion, and by giving to the first matter extension and solidity, it renders the corporeal world intelligible; and accounts for those appearances which are called secondary qualities, in a manner perfectly satisfactory. Aristotle indeed opposed the Atomic philosophy, and had influence enough to bring it into disrepute for many ages; but when he insisted that the two constituent principles of body are *matter* and *form*, both independent of all sentient beings, and which may be conceived as existing distinct from each other, he substituted for a simple and sublime theory an absurd and incomprehensible fiction.

Of the Essences of Bodies.

CHAP. II. *Of the* ESSENCES *of* BODIES.

156 The essences of bodies result,

HAVING treated of the substance, qualities, and powers of body, we may seem to have exhausted this part of our subject; but there is still more to be done. Metaphysicians, ancient and modern, have introduced another term into the science, to denote that which distinguishes one species or sort of bodies from all other species or sorts; and this term we shall briefly explain. Gold is apparently different from lead, and from every other species of metal; a horse is apparently different from an ox, and from every other species of animals; and all animals apparently differ from all vegetables, as vegetables differ from metals.

157 According to the Peripatetics and Platonists, from essential forms;

It is only with the *bodies*, not the minds of animals, that we are at present concerned; and we have seen that all bodies are composed of the same matter.—What then is it that makes different bodies exhibit to us such different appearances; or, in other words, how come they to be possessed of such different qualities and powers? It is (say the followers of Plato and Aristotle) from their having different *essential forms*, by which every natural substance is essentially characterised; for of every animal, vegetable, or metal, &c. there is a *form* conceived, as existing before the individuals in which it is incorporated, from which result all the properties of that animal, vegetable, or metal, such as *figure*, *size*, *colour*, and the other qualities

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(L) Υπολαβε τοινυν ουτωσι κατα τα ομματα πρωτον, ὁ δη καλεις χρωμα λευκον μη ειναι αυτο ἑτερον τι εξω των σων ομματων, μηδ' εν τοις ομμασι, αλλα μελαν τε και λευκον και ὁτιουν αλλο χρωμα εκ της προσβολης των ομματων προς την προσηκουσαν φοραν φανειται γεγενημενον, και ὁ δη ἑκαστον ειναι φαμεν χρωμα, ουτε το προσβαλλον ουτε το προσβαλλομενον αλλα μεταξυ τι ἑκαστῳ ιδιον γεγονος.

(M) Protagoras was a follower of Leucippus and Democritus in every thing, and of course an atheist.—This, however, does not hinder him from having been a correct physiologist with respect to the composition of body; and as such only is he quoted by us. It is, indeed, melancholy to think, that there was hardly a sect of ancient philosophers in which there were not many atheists.

(N) Αρχη δε εξ ἡς και ἁ νυν δη ελεγομεν παντα ηρτηται ἡδε αυτων, ὡς το παν κινησις ην και αλλο παρα τουτο ουδεν, της δε κινησεως δυο ειδη, πληθει μεν απειρον ἑκατερον, δυναμιν δε το μεν ποιειν εχον, το δε πασχειν, &c.——See the *Theætetus*; see also *Cudworth's Intellectual System*, Book I. chap. i.

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ties perceptible by our senses: but this *internal and essential form* itself, from which all other forms result, is not perceptible by our senses, nor even by our understanding directly and immediately, nor otherwise than by the analogy formerly mentioned. These essential forms, we are told, mean something, which, though different from matter, can yet never subsist without it; something which, united with it, helps to produce every *composite* being, that is to say, in other words, every natural substance in the visible world.

158 But these forms have no existence.

This assertion Mr Harris submits with deference to his contemporaries; because (says he) "I speak perhaps of spectres as shocking to some philosophers as those were to Æneas which he met in his way to hell—*Terribiles visu formæ.*" The elegant author's unwillingness to frighten his contemporaries, was a proof of his amiable and benevolent disposition; but he needed not to have suffered from any such apprehension. Those spectres, apparently so dreadful, had long before been laid to rest by the incomparable Cudworth, who has demonstrated, that *essential forms* different from matter and motion, as they have no real existence, had no place in the most ancient philosophy; and that the different appearances or sensible qualities which different bodies exhibit, are the result of the different contexture of their insensible parts. Thus, gold and lead are composed of the same primary matter, but the atoms or minute parts of that matter are in the one substance differently combined from what they are in the other; and this different combination is the sole cause that gold is specifically heavier than lead, more ductile, and of a different colour, &c. For the very same reason, iron is harder than either gold or lead, specifically lighter, and possessed of many other sensible qualities which are not found in either of these substances. One vegetable differs from another externally in size, colour, taste, smell, rapidity of growth, and proportion of parts, &c. but all vegetables are composed of the same matter; and the external difference which prevails among them is the result of a different structure and motion of their insensible parts. The same is to be said of the differences which prevail among the bodies of animals; they all result from internal organization and motion, and from nothing else, whatever be the immediate cause of that motion.

159 The real essences of bodies unknown to us.

This particular internal texture and motion of insensible parts, is that which makes one sort of bodies differ externally from every other sort of bodies; and it is by modern metaphysicians called the *real essence* of bodies. Thus, that internal texture of minute parts, which makes gold of a bright yellow, extremely ductile, specifically heavier than all other metals, and soluble in *aqua regia*, is the real essence of gold; but what that essence is in itself no man can tell, as we perceive only the qualities which result from it. We are, however, certain, that it is different from the real essences of lead and iron, because it produces different effects from those which are produced by these essences; and different effects are never produced in the same circumstances by the same cause.

We have called the internal texture and motion of the insensible parts of bodies their *real essences*, to distinguish them from other *essences* which are only *nominal*, and with which we are perfectly acquainted, because they are the fabrication of our own minds.—Thus, a beautiful bright yellow, a certain specific gravity, extreme ductility, and solubility in *aqua regia*, are the qualities by which we distinguish gold from all other metals. Of these qualities we frame a sort of general conception, which we call the *essence* of gold; and every substance in which we find this essence, we class under the specific name gold. For though it is obvious that our conceptions cannot be the *real essences* of things external, yet are they sufficient guides to these essences, as we know that bodies which, being all formed of the same matter, have the very same sensible qualities, must likewise have the same internal organization or texture of parts, because it is only in that organization or texture that one body can differ from another.—And so much for bodily substance, qualities, and essences.

Of the Existence of Matter.

160 Nominal essences what they are.

Chap. III. *Of the* Existence *of* Matter.

We have endeavoured to prove, that all corporeal substances consist of minute atoms, solid and extended; and that the sensible qualities of every body result from the combination and motion of the atoms of which that body is composed. The celebrated Berkeley, Bishop of Cloyne, however, attempted to demonstrate that these atoms have no real existence; and that the very supposition of a solid, extended, and inert substance, being the archetype of our ideas, involves in it an absurdity and contradiction.

16[?] Berkeley attempts to demonstrate that matter has no existence.

It is universally allowed, that all our knowledge of matter is derived through the senses, either immediately in the very act of sensation, or mediately by an association which is resolvable into a process of reasoning. According to the principles which we have stated, and laboured to establish, matter itself is no immediate object of the senses; and as these are the principles upon which the Bishop erected his demonstration, it will be incumbent upon us to consider his theory, because it has been represented as in the highest degree pernicious, and as leading to universal scepticism.

161 The view of his system given by his antagonists.

The author of the *Essay on the Nature and Immutability of Truth*, represents Berkeley as teaching us, "that external objects (that is, the things which we take for external objects) are nothing but ideas in *our* minds; in other words, that they are in *every respect* different from what they appear to be; that matter exists not but in *our* minds; and that independent on *us* and *our* faculties, the earth, the sun, and the starry heavens, have no existence at all; that a lighted candle hath not *one* of *those qualities* which it *appears to have*; that it is not white, nor luminous, nor round, nor divisible, nor extended; but that, for any thing we know, or can ever know to the contrary, it may be an Egyptian pyramid, the king of Prussia, a mad dog, the island of Madagascar, Saturn's ring, one of the Pleiades, or nothing at all." With respect to the consequences of this theory, he affirms, that "it is subversive of man's most important interests, as a moral, intelligent, and percipient being; and not only so, but a so, that if it were universally and seriously adopted, ed, the diffolution of fociety, and the deftruction of mankind, would neceffarily enfue within the compafs of a month."

The diffolution of fociety and the deftruction of mankind are indeed difmal confequences—enough to make a man fhudder in his clofet. But do they really flow from Berkeley's fyftem? They certainly do, if it be the aim of that fyftem to prove that a candle has not any one quality which it appears to have, and that it may be a *mad dog*; for fhould all philofophers, by fome means or other, become converts to the theory of Berkeley, as we know that the bifhops Sherlock, Smalridge, and others, actually did, the diffolution of fociety and the deftruction of mankind would indeed be inevitable. The fcribbling race, by ufing mad dogs for candles, would all become infected with the hydrophobia; and having their natural irritability augmented by the canine rabies, they would bite and tear till not a human being were left alive.

But to drop this ludicrous ftyle, fo unfuitable to philofophical inveftigation and calm inquiry, we beg leave to affirm, that the theory of Berkeley is here totally and grofsly mifrepresented, and that not one of thofe dangerous confequences which flow from that mifreprefentation can be fairly deduced from any thing taught in *The Principles of Human Knowledge* and the *Dialogues on the Exiftence of Matter*. So far is Berkeley from teaching that external things are nothing but ideas in *our* minds, and that they are in every refpect different from what they appear to be, that he teaches the very reverfe of this in the plaineft language poffible. "I am of a vulgar caft (fays he), fimple enough to believe my fenfes, and leave things as I find them. It is my opinion, that the real things are thofe very things I fee and feel and perceive by my fenfes. That a thing fhould really be perceived by my fenfes, and at the fame time not really exift, is to me a plain contradiction. When I deny fenfible things an exiftence out of the mind, I do not mean *my* mind in particular, but *all* minds Now it is plain they have an exiftence exterior to my mind, fince I find them by experience to be independent of it. There is therefore fome other mind wherein they exift during the intervals between the times of my perceiving them; as likewife they did before my birth, and would do after my annihilation. And as the fame is true with regard to all other finite created fpirits, it neceffarily follows there is an *omnipotent eternal mind*, which knows and comprehends all things, and exhibits them to our view in fuch a manner, and according to fuch rules, as he himfelf hath ordained, and are by us termed the laws of nature."

So far is Berkeley from teaching that, independent on *us* and *our* faculties, the earth, the fun, and the ftarry heavens, have no exiftence at all, and that a lighted candle has not one of thofe qualities which it appears to have, that he over and over affirms the direct contrary; that the univerfe has a real exiftence in the mind of that infinite God in whom, according to the fcriptures, we all live, and move, and have our being; that a lighted candle has not only all thofe qualities which it appears to have, but that, with refpect to us, it has nothing elfe; that fo far from being continually deceived by our fenfes, we are never deceived by them; and that all our miftakes concerning matter are the refult of falfe inferences from true fenfations.

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The Bifhop makes the fame diftinction that we have made between ideas and notions; reftraining the ufe of the former term to denote the relicts of fenfation, and employing the latter to denote our knowledge or conception of fpirits and all fuch objects as are not perceived by fenfe. He likewife affirms, that we can have no *idea* of an external inert fubftance; becaufe an idea can be like nothing but another idea, or the fenfation of which it is a relict: and as all mankind admit that ideas and fenfations can have no exiftence but in the mind of a percipient being, he therefore infers that we can have no *idea* of any thing exifting unperceived, and by confequence can have no idea of matter in the philofophical fenfe of that word. Solidity, extenfion, divifibility, motion, figure, colour, tafte, and all thofe things which are ufually called qualities primary and fecondary, being according to him mere ideas, can have no exiftence but in a mind perceiving them; but fo far is he from fuppofing their exiftence to depend upon the perception of our minds, that he fays exprefsly, "When in broad day-light I open my eyes, it is not in my power to choofe whether I fhall fee or no, or to determine what particular objects fhall prefent themfelves to my view; and fo likewife as to the hearing and other fenfes, the ideas imprinted on them are not creatures of my will There is therefore fome other will or fpirit that produces them. The queftion between the materialifts and me is not, Whether things have a real exiftence out of the mind of *this* or *that* perfon? but, Whether they have an abfolute exiftence, diftinct from being perceived by *God*, and exterior to *all minds?* I affert, as well as they, that fince we are affected from without, we muft allow powers to be without in a being diftinct from ourfelves. So far we are agreed. But then we differ as to the kind of this powerful being. I will have it to be fpirit; they matter, or I know not what third nature. Thus I prove it to be fpirit: From the effects I fee produced, I conclude there are actions; and becaufe actions, volitions (for I have no notion of any action diftinct from volition); and becaufe there are volitions, there muft be a will. Again, the things I perceive muft have an exiftence, they or their archetypes, out of my mind: but being ideas, neither they nor their archetypes can exift otherwife than in an underftanding: there is therefore an underftanding. But will and underftanding conftitute in the ftricteft fenfe a mind or fpirit. The powerful caufe, therefore, of my ideas is, in ftrict propriety of fpeech, a fpirit."

164 That theory, however improbable, certainly poffible, and

This is a faithful abftract of Berkeley's theory given in his own words. Matter, according to him, cannot be the *pattern* or *archetype* of ideas, becaufe an idea can refemble nothing but another idea, or the fenfation of which it is a relict. Matter, he thinks, cannot be the *caufe* of ideas; for every caufe muft be active, and matter is defined to be inert and incapable of action. He therefore infers, that all our fenfations of what we call the qualities of body are the effect of the immediate agency of the Deity upon our minds; and that corporeal fubftance has no exiftence, or at leaft that we have no evidence of its exiftence. That fuch may *poffibly* be the origin of our fenfations, we

that

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man will deny who reflects upon the infinite power and wiſdom of the Agent from whom they are ſaid to proceed. Dr Reid himſelf, the ableſt of all Dr Berkeley's opponents, frankly acknowledges that no man "can ſhow, by any good argument, that all our ſenſations might not have been as they are, though no body or quality of body had ever exiſted."

165 In its conſequences harmleſs.

In its conſequences we do not perceive that this theory can be hurtful either to religion, to virtue, or to the buſineſs of common life; for it only explodes the notion of a ſubſtratum, which, though it may have a real exiſtence, was never thought of by the generality of mankind in any nation under heaven. Dr Beattie indeed affirms, that in "leſs than a month after the nonexiſtence of matter ſhould be univerſally admitted, he is certain there could not, without a miracle, be one human creature alive on the face of the earth." But this aſſertion muſt be the conſequence of his miſtaking Berkeley's nonexiſtence of matter for the nonexiſtence of ſenſible objects, the reality and exiſtence of which the Biſhop never denied. On the contrary, he expreſsly ſays, "We are ſure that we really ſee, hear, feel; in a word, that we are affected with ſenſible impreſſions; and how are we concerned any farther? I *ſee* this cherry, I *feel* it, I *taſte* it; and I am ſure *nothing* cannot be ſeen, or felt, or taſted: it is therefore *real*. Take away the ſenſations of ſoftneſs, moiſture, redneſs, tartneſs, and you take away the cherry." All this is equally true and equally conceivable, whether the combined ſenſations which indicate to us the exiſtence of the cherry be the effect of the immediate agency of God or of the impulſe of matter upon our minds; and to the lives of men there is no greater danger in adopting the former than the latter opinion.

166 A conſequence of Berkeley's theory; which

But it has been ſaid, that Berkeley's doctrine neceſſarily leads to ſcepticiſm in religion, as the ſame kind of reaſoning which he employs to prove the non-exiſtence of matter, operates equally againſt the exiſtence of mind, and conſequently againſt the poſſibility of a future ſtate of rewards and puniſhments. "The rational iſſue of this ſyſtem (we are told) is ſcepticiſm with regard to every thing excepting the exiſtence of our ideas and their neceſſary relations. For ideas being the only objects of thought, and having no exiſtence but when we are conſcious of them, it neceſſarily follows, that there is no object of our thought which can have a continued and permanent exiſtence. Body and ſpirit, cauſe and effect, time and ſpace, to which we were wont to aſcribe an exiſtence independent of our thought, all are turned out of exiſtence by this ſhort dilemma: Either thoſe things are ideas of ſenſation or reflection, or they are not: If they are ideas of ſenſation or reflection, they can have no exiſtence, but when we are conſcious of them: If they are not ideas of ſenſation or reflection, they are words without any meaning."

This ſophiſm was advanced as a conſequence from Berkeley's principles by Mr Hume; and upon theſe principles it has been deemed unanſwerable by ſubſequent philoſophers of great merit. But is it really a part of Berkeley's ſyſtem, or can it be fairly inferred from the principles on which that ſyſtem is built? Theſe queſtions it is fit that Berkeley ſhould anſwer for himſelf: and we ſhall venture to aſſert, that his anſwer will be perfectly ſatisfactory to every reader who attends to the diſtinction, which, after the Biſhop, we have ſtated between ideas and notions.

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167 That the author ſaw and

Though we believe this dangerous inference from Berkeley's principles is commonly attributed to Hume as its author, it did not eſcape the ſagacity of the Biſhop himſelf. In the third dialogue, *Hylas*, who pleads for the exiſtence of matter, thus objects to the reaſoning of his antagoniſt. "Notwithſtanding all you have ſaid, to me it ſeems, that according to your own way of thinking, and in conſequence of your own principles, it ſhould follow, that you are only a ſyſtem of floating ideas, without any ſubſtance to ſupport them. Words are not to be uſed without a meaning. And as there is no more meaning in ſpiritual ſubſtance than in material ſubſtance, the one is to be exploded as well as the other."

168 Obviated but

To this *Philonous* anſwers: "How often muſt I repeat, that I know or am *conſcious* of my own being; and that I myſelf am not my ideas, but ſomewhat elſe; a thinking active principle, that perceives, knows, wills, and operates about ideas? I know that I, one and the ſame ſelf, perceive both colours and ſounds; that a colour cannot perceive a ſound, nor a ſound a colour; that I am therefore one independent principle, diſtinct from colour and ſound; and, for the ſame reaſon, from all other ſenſible things and inert ideas. But I am not in like manner *conſcious* either of the exiſtence or eſſence of matter. Farther, I know what I mean, when I affirm that there is a ſpiritual ſubſtance or ſupport of ideas; *i. e.* that a ſpirit knows and perceives ideas. But I do not know what is meant, when it is ſaid that an unperceiving ſubſtance hath inherent in it, and ſupports, either ideas or the archetypes of ideas. In the very notion or definition of material ſubſtance there is included a manifeſt repugnance and inconſiſtency. But this cannot be ſaid of the notion of ſpirit. That ideas ſhould exiſt in what doth not perceive, or be produced by what doth not act, is repugnant. But it is no repugnancy to ſay, that a perceiving thing ſhould be the ſubject of ideas, or an active being the cauſe of them. That I, who am a ſpirit or thinking ſubſtance, exiſt, I know as certainly as I know that my ideas exiſt. I know likewiſe what I mean by the terms *I* and *myſelf*; and I know this immediately or intuitively; though I do not perceive it as I perceive a triangle, a colour, or a ſound. Ideas are things inactive and perceived; and ſpirits a ſort of beings altogether different from them, by which they are perceived. I do not, therefore, ſay, that my ſoul is an idea, or like an idea. However, taking the word *idea* in a large ſenſe, my ſoul may be ſaid to furniſh me with an idea, that is, an image or likeneſs of God, though indeed extremely inadequate. For all the notion I have of God is obtained by reflecting on my own ſoul, heightening its powers, and removing its imperfections. I have, therefore, though not an inactive idea, yet in myſelf ſome ſort of an active thinking image of the Deity. And though I perceive him not by ſenſe, yet I have a notion of him, or know him, by reflection and reaſoning. My own mind and my own ideas I have an immediate knowledge of; and by the help of theſe do immediately apprehend the *poſſibility* of the exiſtence of other ſpirits and ideas. Farther, Of the Existence of Matter.

from my being, and from the dependency I find in myself and my ideas, I do by an act of reason *necessarily* infer the existence of a God, and of all created things in the mind of God. It is granted that we have neither an immediate evidence, nor a demonstrative knowledge, of the existence of *other finite spirits*; but it will not therefore follow, that such spirits are on a footing with material substances: if, to suppose the one be inconsistent, and if it be not inconsistent to suppose the other; if the one can be inferred by no argument, and there is a probability of the other; if we see signs and effects indicating distinct finite agents like ourselves, and see no sign or symptom whatever that leads to a rational belief of matter. I say, lastly, that I have a *notion* of spirit, though I have not, strictly speaking, an *idea* of it. I do not perceive it as an idea, or by means of an idea; but know it by reflection. Whereas, I neither perceive matter objectively as I do an idea, nor know it as I do myself by a reflex act; neither do I mediately apprehend it by similitude of the one or the other, nor yet collect it by reasoning from that which I know immediately. All which makes the case of matter widely different from that of the Deity and all spirits."

9 ...tia- ...ith the en- ...urst the ...nce of ...r im- ...le.

Thus far we think Berkeley's theory tenible, and its consequences harmless. That by the immediate agency of the Deity all our sensations *might* be what they are though matter had no existence, we think he has proved by arguments unanswerable; and we are likewise of opinion, that by admitting the evidence of sense, consciousness, and reason, in their fullest extent, and by distinguishing properly between those things of which we have *ideas*, and those of which we have *notions*, he has sufficiently secured the existence of spirits or percipient beings, and obviated the irreligious sophistry of Hume before it was conceived by that author. But the good Bishop stops not here. Not satisfied with proving that all our sensations lead us immediately to the Deity, and that, for aught we know, matter, as defined by philosophers, may have no separate existence, he proceeds farther, and endeavours to prove that matter cannot possibly exist. This appears even in the extracts which we have quoted from his book, in which he talks of the repugnance and inconsistency of the notion. In this part of his system, we think he errs greatly, and advances an opinion altogether inconsistent with his own just principles.

10 ...fon.

The repugnance of which he speaks, arises solely from considering solidity and extension as relicts of sensation, or ideas of the same kind with those of heat and cold, tastes and sounds. "Light, and colours, heat and cold, extension and figures; in a word, the things we see and feel; what are they (says his Lordship), but so many sensations, notions, ideas, or impressions, on sense? and is it possible to separate even in thought any of these from perception? Some there are who make a distinction betwixt *primary* and *secondary* qualities: by the former, they mean extension, figure, motion, rest, solidity or impenetrability, and number: by the latter, they denote all other sensible qualities, as colours, sounds, tastes, and so forth.—The ideas we have of these they acknowledge not to be the resemblances of any thing existing without the mind, or unperceived; but they will have our ideas of the primary qualities to be patterns or images of things which exist without the mind, in an unthinking substance which they call *matter*. But it is evident that extension, figure, and motion, are only ideas existing in the mind; that without extension solidity cannot be conceived; that an idea can be like nothing but another idea; and that consequently neither they nor their archetypes can exist in an unperceiving substance. Hence it is plain, that the very notion of what is called *matter* or *corporeal substance*, involves a contradiction in it."

11 fallacious.

This account of extension and solidity affords a striking instance how much the most vigorous and upright mind is liable to be warped by prejudice in behalf of a darling theory, and how apt the clearest understanding is to be blinded by the equivocal use of terms. That Bishop Berkeley possessed a vigorous and perspicacious mind, his most vehement antagonists are eager to admit; and that his intentions were good, is known to all Europe. Yet by the equivocal use of the word *idea*, which the writings of Locke had then introduced into the language of philosophy, he has here suffered himself to lose sight of a very proper and accurate distinction, which, so far as we know, was among the moderns first made by himself between *ideas* and *notions*. According to the Bishop, "we have a *notion* of power and a *notion* of spirits, but we can have no *idea* either of the one or the other; for all ideas being passive and inert, they cannot represent unto us by way of image or likeness that which acts. Such is the nature of *spirit* or that which acts, that it cannot be of itself perceived, but only by the effects which it produceth. It must be owned, however, that we have some *notion* of soul, spirit, and the operations of the mind, such as willing, loving, hating, inasmuch as we know or understand the meaning of these words."

Now we beg leave to affirm, that what is here said of spirits, and of which we readily admit the truth, is equally true of material or solid substances. We have no *ideas* of solidity and extension, because these things are not originally impressed upon the senses; but we have very distinct though relative *notions* of them, for they are clearly perceived by the effects which they produce. That this is at least possible, we have the acknowledgment of Bishop Berkeley himself: for he "freely owns, that from a cause, effect, operation, sign, or other circumstance, there may reasonably be inferred the existence of a thing not immediately perceived; and that it were absurd for any man to argue against the existence of that thing, from his having no direct and positive notion of it." This is exactly the case with respect to solid substances. These substances we do not immediately perceive; but we infer their existence from effects, signs, and other circumstances, and we have of them very clear though relative notions. Thus a man can open and shut his empty hand; but when he grasps an ivory ball of three or four inches diameter, he feels, that though the same power be exerted, his hand cannot then be shut. He is conscious that there is no change in himself; and being intuitively certain that every effect must have a cause, he infers with the utmost confidence, that the cause which prevents his hand from shutting is in the ball; or, in other words, that

that the thing which communicates to his eye the ſenſation of colour, and impreſſes upon his hand a ſenſation of touch, muſt be ſolid or impenetrable. Solidity, however, is not the ſenſation itſelf; it is only the cauſe of the ſenſation; and therefore it is ſo far from being an idea in our minds, that we are conſcious our notion of it is of a thing totally different from all our ideas, of a thing external, at leaſt to our minds. Indeed the notion itſelf is not poſitive; it is only relative, and inferred from the effects which are produced on our ſenſes. That it is the *ſame* thing which communicates to our eye the ſenſation of colour, and has the power of reſiſting the compreſſion of our hand, is evident; becauſe, when the ball is thrown away, the reſiſtance as well as the actual ſenſation vaniſh at once.

172 The idea of colour and the notion of ſolidity not naturally inſeparable.

From this fact, which a leſs acute man would think a proof that the reſiſtance was not occaſioned by the immediate agency of the Supreme Being, but by the impenetrability of a ſolid ſubſtance of ſmall dimenſions, the Biſhop argues thus againſt the *poſſibility* of ſuch a ſubſtance: "They who aſſert that figure, motion, and the reſt of the primary or original qualities, do exiſt without the mind in unthinking ſubſtances, do at the ſame time acknowledge, that colours, ſounds, heat, cold, and ſuch like ſecondary qualities, do not; which they tell us are ſenſations exiſting in the mind alone, that depend on and are occaſioned by the different ſize, texture, and motion, of the minute particles of matter. This they take for an undoubted truth, which they can demonſtrate beyond all exception. Now if it be certain, that thoſe original qualities are inſeparably united with the other ſenſible qualities, and not even in thought capable of being abſtracted from them, it plainly follows, that they exiſt only in the mind. But I deſire any one to reflect and try whether he can by any abſtraction of thought conceive the extenſion and motion of a body, without all other ſenſible qualities. For my own part, I ſee evidently that it is not in my power to frame an idea of a body extended and moved, but I muſt withal give it ſome colour or other ſenſible quality, which is acknowledged to exiſt only in the mind. In ſhort, extenſion, figure, and motion, abſtracted from all qualities, are inconceivable. Where, therefore, the other ſenſible qualities are, there muſt be theſe alſo, to wit, in the mind, and no where elſe."

In this reaſoning, though plauſible, there is an unintended fallacy. It is indeed true, that we cannot contemplate in imagination a ſolid ſubſtance without conceiving it to have ſome colour; but there is ſufficient reaſon to believe, that this union of colour and ſolidity in our minds is not the effect of nature as it operates at firſt upon our ſenſes, but merely the conſequence of early and deep-rooted aſſociation. Biſhop Berkeley himſelf has taught us, that the objects of ſight are not at a diſtance; and that if a man born blind were ſuddenly made to ſee, he would conceive the objects of his ſight as exiſting either in his eye or in his mind. This is a truth which no man will controvert who has dipt into the ſcience of optics, or who has even paid the ſlighteſt attention to the perceptions of infants; and if ſo, it follows, that to a man born blind and ſuddenly made to ſee, colour and ſolidity would not appear united. Were ſuch a perſon to lay hold of an ivory ball and raiſe it to the elevation of his eye, he would perceive whiteneſs as a new ſenſation exiſting in his eye or his mind, but he would feel reſiſtance at the extremity of his arm. He would not have the leaſt reaſon to conclude, that this whiteneſs was inſeparably united to the cauſe of this reſiſtance; and he would, in fact, draw no ſuch concluſion, till experience had taught him, that by removing the ball or cauſe of reſiſtance from his hand, he at the ſame time removed the ſenſation from his eye. After repeated experiments, he would indeed diſcover, that the cauſe of colour to the eye, was likewiſe by ſome means or other the cauſe of reſiſtance to the hand; and he would ſo aſſociate theſe in his mind, that the one would never afterwards make its appearance as an idea or a notion without bringing the other along with it. The whole difficulty, therefore, in this caſe, is to break an early and deep-rooted aſſociation; for it is plain that the aſſociated ideas were not originally united, and that ſolidity and colour were at firſt conceived as ſeparate.

If the reader perceive not the force of this reaſoning, we beg leave to recommend to him the following experiment, which, if we miſtake not, will carry conviction to his judgment, that in the laſt quoted paſſage Biſhop Berkeley has argued fallaciouſly, and that extenſion and colour are not *inſeparably* united as ideas in the mind. Let him go into a dark room, containing a number of ſpherical bodies of various colours; let him take one of them into his hand; and he will inſtantly *feel* reſiſtance, and have a *notion* of extenſion and ſolidity; but will he likewiſe have the *idea* of colour inſeparably united with this notion? The Biſhop ſays he will: and if ſo, it muſt be the idea of ſome *particular* colour; for his Lordſhip has taught us, that the *abſtract* and *general* idea of colour, which is neither *red*, nor *green*, nor *blue*, &c. cannot poſſibly be formed. The man, then, we ſhall ſuppoſe, whilſt he feels reſiſtance, conceives the reſiſting body to be *green*; and holding it ſtill in his hand, walks into the light of day. The *reſiſtance*, and conſequently the *cauſe* of reſiſtance, remains unchanged; but what becomes of the inſeparable union of thoſe with colour, when the body, upon being actually ſeen, proves to be *black*, i. e. to have no colour at all?—It appears, therefore, undeniable, that ſolidity and colour are not united in nature; that the one is an eſſential quality of ſomething external to us, of which we have no *idea*, but a very diſtinct though relative *notion*; and that the other is an actual ſenſation in our minds, cauſed by the impreſſion of ſomething external on the organ of ſenſe, which leaves behind it in the memory or imagination a poſitive and direct *idea* that exiſts no where elſe.

173 Matter exiſts, b[ut]...

Solid ſubſtance, therefore *may* exiſt, for though it is not immediately perceived by the ſenſes, and is a thing of which we can have no *idea*, we acquire a clear and diſtinct *notion* of it, by the very ſame means which Biſhop Berkeley thinks ſufficient to give us diſtinct notions of power and of ſpirits; and, therefore, that notion can involve in it no contraction. Still, however, we would not ſay with Dr Beattie, "that we could as eaſily believe, that two and two are equal to

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ten; or, that whatever is, is not; as that matter has no separate existence:" for it is certainly *possible*, that the Supreme Being, without the instrumentality of matter, could communicate to our minds all the sensations and notions from which we infer the reality of solid substance. All that we contend for, as having the evidence of demonstration, is the *possibility* of solid and extended substance; and if the thing be *possible*, the general voice of mankind proclaims its *probability*.— We are *conscious* of our actual sensations, and we know by *experience* that they are caused by something distinct from ourselves. When a man grasps an ivory ball, he *feels* that he cannot shut his hand, and he knows that the resistance which prevents him proceeds *not* from *himself*. Thus far all mankind are agreed. But Bishop Berkeley says, that the resistance proceeds immediately from the Supreme Being or some other spirit; whilst we, without pretending that his scheme is impossible, think it more natural to suppose that the man's hand is kept from shutting by the resistance of a solid substance of four inches diameter; of which substance, though we have no *idea* of it, we have as distinct a *notion* as Berkeley had of spirits. From one or other of these causes this effect must proceed; and it is of little importance to life or happiness which of them be the true cause, since it is with the effect only that we are immediately concerned. Still, however, a philosopher would choose to adopt the easiest and most natural side of every alternative; which, if our notion of solidity be just, is certainly, in the present case, the existence of matter.

4 Whether some philosophers have denied the solidity of matter.

After treating so largely of the composition of bodies, and showing the general agreement of metaphysicians ancient and modern with respect to the notion of their solidity, it will appear strange to the less philosophical part of our readers, that we should now express a doubt of that notion's being well-founded.— We have ourselves no doubt, but on the contrary are fully convinced, that solidity is essential to matter. This, however, has of late been denied by philosophers of great merit. Dr Priestley, after Mr Mitchell and Father Boscovich, affirms that matter is *not solid* or impenetrable to other matter; and that it has, in fact, no properties but those of *attraction* and *repulsion* ‡. The proofs of this position, which appears so paradoxical, he draws from optical experiments, from electricity, and from the effects of heat and cold upon substances usually conceived to be solid.

‡ Disquisitions on Matter and Spirit.

Arguments used for and against this hypothesis.

The appearances from which the solidity of matter is inferred, are nothing more, he says, than superficial appearances, and therefore have led to superficial and false judgments, which the *real appearances* will not authorise. "*Resistance*, on which alone our opinion concerning the solidity or impenetrability of matter is founded, is never occasioned by *solid matter*, but by something of a very different nature, viz. a *power of repulsion*, always acting at a real, and in general an assignable distance, from what we call the body itself. When I press my hand against the table, I naturally imagine that the obstacle to its going through the table, is the *solid matter* of which it consists; but a variety of philosophical considerations demonstrate that it generally requires a much greater power of pressure than I can exert to bring my fingers into actual contact with the table. Electrical appearances show that a considerable weight is requisite to bring into seeming contact even the links of a chain hanging freely in the air, they being kept asunder by a repulsive power belonging to a very small surface, so that they do not actually touch, though they are supported by each other. It has been shown, from optical considerations, that a drop of water rolls upon a cabbage leaf without ever coming into actual contact with it; and indeed all the phenomena of *light* are most remarkably unfavourable to the hypothesis of the solidity or impenetrability of matter. When light is reflected back from a body on which it seems to strike, it was natural to suppose that this was occasioned by its impinging against the *solid parts* of the body; but it has been demonstrated by Sir Isaac Newton, that the rays of light are always reflected by a *power of repulsion* acting at some distance from the body. Again, when part of a beam of light has overcome this power of repulsion, and has entered any transparent substance, it goes on in a right line, provided the medium be of a uniform density, without the least interruption, and without a single particle being reflected, till it comes to the opposite side, having met with no solid particles in its way, not even in the densest transparent substances, as glass, crystal, or diamond; and when it is arrived at the opposite side, it is solely affected by the laws of attraction and repulsion.

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"Nay, that the component particles of the hardest bodies themselves do not actually touch one another, is demonstrable from their being brought nearer together by cold, and by their being removed farther from each other by heat. The power sufficient to overcome these internal forces of repulsion, by which the ultimate particles of bodies are prevented from coming into actual contact, is what no person can pretend to compute. The power requisite to break their cohesion, or to remove them from the sphere of each other's attraction, may in some measure be estimated; but this affords no *data* for ascertaining the force that would be necessary to bring them into actual contact, which may exceed the other almost infinitely."

From these facts, Dr Priestley infers, that the mutual resistance of bodies proceeds in all cases from powers of repulsion acting at a distance from each body: that the supposition of the *solidity* or *impenetrability* of matter is destitute of all support whatever; and that matter itself is nothing but powers of attraction and repulsion, and several spheres of them, one within another. As other philosophers have said, "Take away solidity, and matter vanishes;" so he says expressly, "Take away attraction and repulsion, and matter vanishes."

To illustrate this strange notion, "Suppose (says he) that the Divine Being, when he created *matter*, only fixed certain *centres of various attractions and repulsions*, extending indefinitely in all directions, the whole effect of them to be upon each other; these centres approaching to, or receding from each other, and consequently carrying their peculiar spheres of attraction and repulsion along with them, according to certain definite circumstances. It cannot be denied that these spheres may be diversified infinitely, so as to correspond to all the kinds of bodies that we are acquainted with, or that are possible. For all effects in which

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bodies are concerned, and of which we can be sensible by our eyes, touch, &c. may be resolved into attraction or repulsion. A compages of these centres, placed within the spheres of each other's attraction, will constitute a body that we term *compact*; and two of these bodies will, on their approach, meet with a repulsion or resistance sufficient to prevent one of them from occupying the place of the other, without a much greater force than we are capable of employing; so that to us they will appear perfectly hard.

"As, in the constitution of all actual bodies that we are acquainted with, these centres are placed so near to each other, that in every division that we can make we still leave parts which contain many of these centres; we, reasoning by analogy, suppose that every particle of matter is infinitely divisible; and the *space* it occupies is certainly so. But, strictly speaking, as those centres which constitute any body are not absolutely infinite, it must be naturally possible to come by division to one single centre, which could not be said to be divisible, or even to occupy any portion of space, though its sphere of action should extend ever so far; and had only *one* such centre of attraction, &c. existed, its existence could not have been known, because there would have been nothing on which its action could have been exerted; and there being no *effect*, there could not have been any ground for supposing a *cause*."

In answer to this reasoning against the solidity of matter, Dr Priestley was frequently asked by his candid and masterly antagonist *, "What it is that attracts and repels, and that is attracted and repelled?" But to the question he was never able to give a satisfactory answer. Indeed, how could he have been able? for, as Dr Price argues, "Exclusive of attraction and repulsion, he affirms matter to be absolutely nothing; and therefore, though we were to allow it the power of attracting and repelling, yet as it is nothing but this power, it must be the power of nothing, and the very idea of it be a contradiction."

* *Free Discussion between Dr Price and Dr Priestley.*

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founded on fallacious appearances and contrary to an intuitive and necessary truths.

If there be any class of truths intuitively certain, that class comprehends the two following propositions: POWER CANNOT BE WITHOUT A SUBJECT; and NOTHING CAN ACT WHERE IT IS NOT. If, therefore, there be powers of attraction and repulsion, (which shall be considered afterwards in the Chapter of MOTION), there must be a subject of those powers; and if matter, whether solid or unsolid, be the subject, it cannot possibly attract or repel at a *distance*. Sir Isaac Newton, in his letters to Dr Bentley, calls the notion that matter possesses an innate power of attraction, or that it can act upon matter at a distance, and attract and repel by its own agency, "an absurdity into which, he thought, no one could possibly fall." Hence it follows, that the appearances from which Dr Priestley infers the penetrability of matter must be fallacious appearances, since they contradict an intuitive and necessary truth. The facts which he instances are, indeed, such as would make most other men suspicious of fallacy, and in his reasonings from them he sometimes takes for granted the truth to be proved. The links of a chain used for electrical purposes, supposing them to be in contact with each other, can touch only with very small surfaces. The electrical fluid is of considerable density, and incapable of being absorbed within a very narrow compass. This is evident, because it passes not through paper and other porous bodies without making a passage for itself, and leaving a visible aperture behind it; and though it assimilates with metals, and passes through them more easily than through other bodies, yet is it plain that it requires a certain quantity of metal to conduct it; for when the conductor falls short of the necessary quantity, it is melted or dissipated by the force of the fluid. This being the case, it follows that the links of a chain *may be* in actual contact (we do not positively affirm that they *are*), and yet the fluid become visible in passing from link to link; for if the point of contact be too small to absorb the *whole* fluid, *part* of it must pass without any metallic conductor through the atmosphere, and thus become apparent to the eye of the spectator.

With respect to light, it is obvious that there cannot possibly be any *demonstration*, in the logical sense of the word, that it is reflected by a power of repulsion acting at some distance from the body; for, in the opinion of all mankind, the primary and solid atoms of matter are too minute to fall under the cognisance of our senses, however assisted by art; and therefore, if light *appears* to be reflected at a distance from the surface of the body, we must conclude, either that between the point of reflection and the apparent surface of the body, there are solid atoms unperceived by us, or that light is reflected by the agency of some other substance than matter. One of these conclusions, we say, *must* be drawn, because they are both *possible*, and there is no other alternative but to admit one of them, or to suppose that a thing may act where it is not; which is as clearly absurd and *impossible* as that *whatever is, is not*. Again, when part of a beam of light has entered any transparent substance, how does Dr Priestley know that it goes on in a right line, without the least interruption, till it comes to the opposite side? This he can know only by his senses; but the beam may meet with ten thousand interruptions from objects which the senses cannot perceive, and may describe a zig-zag line, of which the deflections are so small as to elude the keenest eye aided by the most powerful glass.

That the component particles of the hardest bodies do not *all* actually touch one another, is indeed evident from the effects of cold and heat upon those bodies: but it does not therefore follow that those bodies have no component particles; but only, that they are fewer in number than we are apt to imagine; that all the solid matter in the universe might possibly be compressed within a very narrow sphere; and that it is held together in different bodies and different systems by a power foreign from itself. These are truths which all philosophers have admitted who have thought sufficiently on the subject; but who will admit Dr Priestley's proposition, when it is translated into common English: "That the component *nothings* of the hardest bodies do not actually touch one another, is demonstrable from their being brought nearer together by cold, and by their being removed farther from each other by heat?"

Dr Priestley owns, that if matter be solid it could act upon other matter by impulse. We are certain, that, whatever it be, it can act upon nothing in the manner

manner which he describes; and therefore, to use the words of Dr Price, "matter, if it be any thing at all, must consist of solid particles or atoms occupying a certain portion of space, and therefore *extended*, but at the same time *simple* and *uncompounded*, and incapable of being resolved into any other smaller particles. It must likewise be the different form of these *primary* particles, and their different combinations and arrangement, that constitute the different bodies and kinds of matter in the universe." This is exactly agreeable to the doctrines of Newton; who, after considering the question in every point of view, concludes, that "in the beginning God formed matter in solid, massy, hard, impenetrable, moveable particles, of such sizes and figures, and with such other properties, as most conduced to the end for which he formed them; and that those primary particles being solid, are incomparably harder than any porous bodies compounded of them; even so very hard as never to wear or break in pieces: no ordinary power being able to divide what God himself made one in the creation." To talk, as Dr Priestley does, of matter's being certain *centres of various attractions and repulsions* extending indefinitely in all directions, and to describe these centres as *not* being *physical points* or *solid atoms*, is either to say, that *nothing* attracts and repels; or it is to introduce the divine agency as the immediate cause of all our sensations. The former of these alternatives Dr Priestley disclaims; the latter he seems willing to admit. But if it be his meaning that all our sensations are caused by the immediate agency of God or created spirits, his scheme differs not from that of Berkeley, except in being less elegantly expressed and less ingeniously supported. Berkeley's scheme is evidently *possible*. The commonly received scheme is likewise possible. It remains therefore with the reader, whether he will adopt the system of the Bishop of Cloyne; or admit, with all other philosophers, that matter exists; that it consists of parts actually distinct and separable; and that each of these parts is a *monad* or solid atom, which requires no foreign agency to keep it united.

Chap. IV. *Of* Space *and its* Modes.

Having considered bodies in their substance, essences, and qualities, and proved that they have a real existence independent of us and our conceptions, we proceed now to inquire into the nature of *space*, *motion*, *number*, and *duration*. These are commonly called the *adjuncts* of body, and are supposed to be absolutely inseparable from its existence. It does not indeed appear that *actual motion* is a necessary adjunct of body, considered as a mere solid, extended, and figured substance; but it is certainly necessary to the existence of organized and animated bodies; and the capability of being moved enters into our conceptions of all bodies whatever. Of these adjuncts, that which first demands our attention is *space*; for without a knowledge of its nature we could not have an adequate idea of motion, and without motion we could have no idea of time.

Every body is extended; and between two bodies not in actual contact, we perceive that a third body may be easily introduced. That which admits of the introduction of the third body is what we call *space*: and if it be totally void of matter, it is called *pure space*. Whether there be any space absolutely pure, has been disputed; but that such space is possible, admits of no dispute. Were any one body (a cannon ball for instance) to be annihilated, and the circumambient air, with every other material substance, kept from rushing into the space which the ball had occupied, that portion of space, with respect to matter, would be empty or pure space: whether it would necessarily be filled with mind shall be considered afterwards. Pure space, therefore, is conceivable; and it is conceived as having three dimensions, length, breadth, and depth, which are generally called the three simple modes of space. In this respect it agrees with body: but the agreement proceeds no farther; for space is conceived as destitute of solidity, without which the existence of body is inconceivable. It has been formerly observed, that whatever may be distinctly conceived may possibly exist; but with respect to the existence of pure space, whatever is possible is real: for it shall be shown in the next section, that were there no space absolutely pure or void of matter, there could be no motion. Our business at present is to inquire what the nature of space is, and what notion we ought to have of its existence.

180 Space supposed to be something different from body and mind, and to be eternal and infinite, &c.

Many modern philosophers consider space as something entirely distinct both from body and mind: some of them ascribe to it no less than four of the attributes of the Deity—*eternity*, *immobility*, *infinity*, and *necessary existence*; and a few of them have gone so far as to call *infinite space* the *sensorium* of the Deity. "The supposal of the existence of *any thing whatever* (says Dr Clarke *) necessarily includes a *presupposition* of the existence of *space*. Nothing can possibly be conceived to exist without thereby presupposing space; which, therefore, I apprehend to be a *property* or *mode* of the self-existent Substance; and that, by being evidently necessary itself, it proves, that the substance of which it is a property must be also necessary." Elsewhere he says, that "space is a property or mode of the self-existent Substance, but not of any other substances. All other substances are *in* space, and are *penetrated* by it; but the self-existent Substance is not in space, nor penetrated by it, but is itself (if I may so speak) the *substratum* of space, the *ground* of the existence of *space* itself." He acknowledges, however, that such expressions as "the self-existent Substance is the *substratum* of space, or space is a property of the self-existent Substance, are *not*, perhaps, very proper: but what I mean (says he), is this: The idea of *space* (as also of *time* or *duration*) is an abstract or partial idea; an idea of a certain *quality* or *relation*, which we evidently see to be necessarily existing; and yet (which not being itself a *substance*) at the same time necessarily *presupposes* a substance, without which it could not exist."

* *Demonstration of the Being and Attributes of God, and Correspondence with a Gentleman in Gloucestershire, passim.*

These opinions respecting space have been adopted by succeeding philosophers of great merit, and particularly by Dr Price; who says, that "it is a maxim which cannot be disputed, that *time* and *place* are necessary to the existence of all things. Dr Clarke (continues he) has made use of this maxim, to prove that infinite space and duration are the essential properties of the Deity; and I think he was right."

Had authority any weight in philosophy, we know not what modern writers we could oppose to the celebrated

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brated names of Clarke and Price, unless it were Bishop Berkeley, Dr Law late bishop of Carlisle, and the author of Ancient Metaphysics. But the question is not to be decided by authority. Learned and acute as Dr Clarke was, his assertions respecting space are contradictory and inconsistent. If nothing can possibly be conceived to exist without thereby presupposing the existence of *space*, how can space be a property or mode of the self existent Substance? Are properties prior in the order of nature, or even in our conceptions, to the substances in which they inhere? Can we frame an abstract idea of figure, or extension, or solidity, before we conceive the existence of any one figured, extended, or solid substance? These are questions which every man is as capable of answering as the Doctors Clarke and Price, provided he can look attentively into his own mind, and trace his ideas to their source in sensation: and if he be not biassed by the weight of great names, we are persuaded he will find, that if it be indeed true, that the supposal of the existence of any thing whatever necessarily includes a *presupposition* of the existence of space, *space* cannot possibly be a *property* or *mode* of the self-existent substance, but must of necessity be a *substance* itself.

181 This supposition controverted.

182 Space necessary to the existence of every thing.

It is, however, *not* true, that the supposal of the existence of any thing whatever necessarily includes a presupposition of the existence of space. The idea of space is indeed so closely associated with every visible and most tangible objects, that we cannot see the one nor feel the other without conceiving them to occupy so much of space. But had we never possessed the senses of sight and touch, we could not have supposed the existence of space necessary to the existence of any thing whatever. The senses of smelling, tasting, and hearing, together with our internal powers of consciousness and intellect, would certainly have compelled us to believe in our own existence, and to suppose the existence of other things; but no object either of consciousness, smelling, tasting, or hearing, can be conceived as occupying space. Space and every thing which fills it are conceived as of three dimensions; but who ever supposed or can suppose an *odour*, *taste*, or *sound*, to have *length*, *breadth*, and *depth*; or an object of consciousness to be an ell or an inch long?

Let us suppose that body and all the visible world had a beginning, and that once nothing existed but that Being which is alone of necessary as well as eternal existence; *space*, say the followers of Dr Clarke, would then exist likewise without bounds or limits. But we desire to know of these gentlemen what sort of a being this space is. It certainly is not *substance*; neither is it a property; for we have seen that the very notions of it, which lead men to suppose its existence *necessary*, render it impossible to be a property of the self-existent Being. Is it then nothing? It "is in one sense*: it is nothing *actually* existing; but it is something *potentially*; for it has the *capacity* of receiving body whenever it shall exist. It is not, and cannot, become any thing itself, nor hath it any actual existence; but it is that without which nothing corporeal could exist." For this reason it was that Democritus and Epicurus made space one of the principles of nature; and for the same reason Aristotle has made *privation* one of his three principles of natural things, *matter* and *form* being the other two. But though the privation of *one* form be doubtless necessary before matter can receive another (for a piece of wax or clay cannot receive the form of a *globe* before it lose the form of a square), yet Aristotle never dreamed that the privation of the square was any property of the globe, or that *privation* itself was to be reckoned a real being. On the contrary, he expresly calls it *το μη ον*, or *the no being*. In this way, if we please, we may consider space, and call it the *privation of fulness* or of body. We have indeed a positive idea of it, as well as of silence, darkness, and other privations: but to argue from such an idea of space, that space itself is something real, seems altogether as good sense as to say, that because we have a different idea of *darkness* from that of *light*, of *silence* from that of *sound*, of the *absence* of any thing from that of its *presence*; therefore *darkness*, *silence*, *absence*, must be real things, and have as positive an existence as *light*, *sound*, and *body*: and to deny that we have any positive idea, or, which is the very same thing, any idea at all, of the privations above mentioned, will be to deny what is capable of the most complete proof (see n° 19), and to contradict common sense and daily experience. There are therefore ideas, and simple ones too, which have nothing *ad extra* correspondent to them; no proper *idiatum*, archetype, or objective reality: and we do not see why the idea of space may not be reckoned of that number. To say that *space* must have existence, because it has some properties (for instance, *penetrability*, or the *capacity* of receiving body), seems† to be the same thing as to urge that *darkness* must be *something* because it has the capacity of *receiving light*; *silence* the property of admitting *sound*; and *absence* the property of being supplied by *presence*. To reason in this manner is to assign absolute negations; and such as, in the same way, may be applied to *nothing*, and then call them *positive properties*; and so infer that the chimera, thus cloathed with them, must needs be *something*.

183 Space a thing the property existence of body.

But it is said, that as we cannot conceive space to be annihilated, it must be some real thing of eternal and necessary existence. If this argument had not been used by writers of great merit, and with the best intention, we should not have scrupled to call it the most contemptible sophism that ever disgraced the page of philosophy. Whatever now has an *actual* existence, must from eternity have had a *possible* existence in the ideas of the Divine mind. Body, as an extended substance, has now an *actual* existence; and therefore it must from eternity have had a *possible* existence in the ideas of the Divine mind: but the *possible existence of body* is all that we can conceive by *space*; and therefore this argument, upon which so much stress has been laid, amounts to nothing more, than that what has from eternity been possible, can at no period have been impossible. It is evident that the *capacity* or *potentiality* of every thing existing must have been from eternity; but is capacity or potentiality a real being? All the men and women who shall succeed the present generation to the end of time, have at this moment a possibility of existence, nor can that possibility be conceived as an impossibility; but is it therefore any thing actually existing either as a substance or a quality?

It has been urged, that space must be something more than the mere absence of matter; because if nothing

* *Ancient Metaphysics.*

† See *Law on King's Origin of Evil*, and *Law's Inquiry into the Idea of Space*, &c.

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thing be between bodies, such as the walls of a room, they must necessarily touch. But surely it is not *self-evident* that bodies must necessarily touch if nothing be between them; nor of the truth of this proposition can any thing like a proof be brought. It is indeed intuitively certain, that "things, when they are in contact, have nothing between them;" and hence it has been rashly inferred, that things, when they have nothing between them, are in contact; but this is an illegitimate conversion of the proposition. Every logician knows, that to convert a proposition, is to infer from it another whose *subject* is the *predicate*, and whose *predicate* is the *subject*, of the proposition to be converted: but we are taught by Aristotle and by common sense, that an *universal* affirmative can be converted only into a *particular* affirmative "Things, when they are in contact, have nothing between them," is an *universal* affirmative proposition; and therefore it can be converted only into the following *particular* affirmative: "Some things, when they have nothing between them, are in contact;" a proposition which by no means includes in it the contact of the walls of an empty room. The reason why the walls of an empty room do not touch, is that they are *distant*; but is *distance*, in the abstract, any thing really existing? Two individuals differ, or there is a difference between them; but is *difference* itself any real external thing? Bodies are long, broad, thick, heavy; but are *length*, *breadth*, *density*, *weight*, properly any thing? Have they any real separate archetypes or external idiata? Or can they exist but in some substance?

The reason why so many philosophers have considered space as a real external thing, seems to be this: Every bodily substance is extended; but space is conceived to be that which contains body, and therefore to space we likewise attribute extension. Extension is a quality which can have no existence but as united with other qualities in some substance; and it is that of which, abstracted from all substances, we can, properly speaking, form no *idea*. We understand the meaning of the word, however, and can reason about that which it denotes, without regarding the particular substance in which extension may inhere; just as we can reason about whiteness without regarding any one white object, though it is self-evident that whiteness, abstracted from all objects, cannot figure in the mind as an idea. Qualities considered in this manner are general and relative notions, the objects of pure intellect, which make no appearance in the imagination, and are far less, if possible, to be perceived by sense: but it is extremely painful to the mind to dwell upon such notions; and therefore the ever-active fancy is always ready to furnish them with imaginary *substrata*, and to make that which was a *general* and *invisible notion* be conceived as a *particular ideal object*. In the case of extension this is the more easily done, that the notion which we have of a *real substratum* or substance, the support of real qualities, is obscure and relative, being the notion of *something* we know not what. Now, by leaving, if we can, solidity and figure out of our conception, and joining the notion of *something* with the notion of *extension*, we have at once the *imaginary substratum* of an *imaginary* quality, or the general notion of extension particularised in an imaginary subject; and this subject we call *space*, vainly fancying that it has a real external and independent existence. Whether this be not all that can be said of space, and whether it be not absurd to talk of its having any real properties, every man will judge for himself, by reflecting upon his own ideas and the manner in which they are acquired. We ourselves have no doubt about the matter. We consider pure space as a mere notion relative to the existence of corporeal substance, as nothing more than the absence of body, where body is possible; and we think the usual distinction between *absolute* and *relative* space, if taken as real, the grossest absurdity. We do not, however, pretend to dictate to others; but recommend it to every man to throw away all respect for great names, to look attentively into his own thoughts, and on this as on all metaphysical subjects to judge for himself.

135 Place, what it is.

Having said so much of space in general, we need not waste much time upon its modes Indeed the only mode of space, after considering it with respect to the three dimensions of body, which now demands our attention, is that which we call *place*. As in the simplest mode of space we consider the relation of distance between any two bodies or points; so, in our idea of *place*, we consider the relation of distance betwixt any thing, and any two or more points, which, being considered as at rest, keep the same distance one from another. Thus, when we find any thing at the same distance now at which it was yesterday from two or more points with which it was then compared, and which have not since the comparison was made changed their distance or position with respect to each other, we say that the thing hath kept its *place*, or is in the *same place*; but if it hath sensibly altered its distance from either of those points, we then say that it hath changed its *place*.

From this view of the nature of place, we need not observe that it is a mere relation; but it may be worth while to advert to this circumstance, that a thing may without falsehood be said to have continued in the same place, and at the same time to have changed its place, according to the different objects with which it is compared. Thus, if two persons find a company of chess-men standing each upon the same square of the chess-board where they left them, the one may with truth affirm that they are all in the *same place*, or unmoved; and the other may with equal truth affirm that they have all changed *place*. The former considers the men only with respect to their distances from the several parts of the chess-board, which have kept the same distance and position with respect to one another. The latter must consider the men with respect to their distance from something else: and finding that the chess-board, with every thing upon it, has been removed, we shall suppose from one room to another, he cannot but say that the chess-men have changed their place with respect to the several parts of the room in which he formerly saw them.

This modification of distance, however, which we call *place*, being made by men for their common use, that by it they may design the particular position of objects where they have occasion for such designation, they determine this *place* by reference to such adjacent things as best serve their present purpose, without regarding other things which, for a different purpose, would better determine the place of the same object.

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Thus in the cheſs-board, the uſe of the *deſignation of the place* of each cheſs-man being determined only within that chequered piece of wood, it would croſs that purpoſe to meaſure it by any thing elſe: but when theſe very cheſs-men are put up in a box, if any one ſhould aſk where the black king is, it would be proper to *determine the place* by reference to ſomething elſe than the cheſs-board; ſuch as the parts of the room or cloſet which contain the box.

186 The universe has no place.

That our idea of *place* is nothing but ſuch a relative poſition of things as we have mentioned, will be readily admitted, when it is conſidered that we can have no idea of the place of the *univerſe*. Every *part* of the univerſe has place; becauſe it may be compared with reſpect to its diſtance from other parts ſuppoſed to be fixed. Thus the earth and every planet of our ſyſtem has a place which may be determined by aſcertaining its diſtance from the ſun and from the orbits of the other planets; and the place of the ſyſtem itſelf may be aſcertained by comparing it with two or more fixed ſtars: but all the ſyſtems taken as *one whole* can have no *place*; becauſe there is nothing elſe to which the diſtance and poſition of that whole can be referred. It is indeed true, that the word *place* is ſometimes uſed, we think improperly, to denote that *ſpace* or portion of *ſpace* which any particular body occupies; and in this ſenſe, no doubt, the univerſe has place, as well as the earth or ſolar ſyſtem: but to talk of the place of the univerſe in the other and proper ſenſe of the word, is the groſſeſt nonſenſe.

Chap. V. *Of* Motion.

187 Mobility eſſential to every corporeal ſubſtance, but not natural motion.

Mobility, or a capacity of being moved, is eſſential to every corporeal ſubſtance; and by actual motion are all the operations of nature performed. Motion, therefore, if it may be called an *adjunct* of body, is certainly the moſt important of all its adjuncts; and to aſcertain its nature and origin demands the cloſeſt attention of the metaphyſician, as well as of the mechanic and aſtronomer. With the *laws* of motion, as diſcovered by experience, we have at preſent no concern: they are explained and fully eſtabliſhed in other articles of this work (ſee Mechanics, Motion, &c.). The principal queſtions which we have to conſider are, "What is motion? and, By what power is it carried on?"

For an anſwer to the firſt of theſe queſtions, the modern metaphyſician refers every man to his own ſenſes; becauſe, in his apprehenſion, the word motion denotes a ſimple idea which cannot be defined. Among the ancients, the Peripatetics were of a different opinion; and Ariſtotle, whoſe love of dialectic made him define every thing, has attempted to give two definitions of *motion*. As ſome learned men are at preſent labouring to revive this ſyſtem, we ſhall, out of reſpect to them, mention thoſe definitions, and make upon them ſuch remarks as to us appear proper.

188 The Peripatetic definitions of motion

The author of *Ancient Metaphyſics* having obſerved, that both nature and art propoſe ſome end in all their operations; that when the end is obtained, the thing operated upon is in a ſtate of perfection or completion; and that in the operations of both nature and art there is a progreſs, and by conſequence a *change*, from one thing to another; adds, that this change is *motion*. Motion, therefore, according to him, is a change or progreſs to the end propoſed, or to that ſtate of perfection or completion which Ariſtotle calls ἐντελέχεια. It is not enough, however, that we know *to what* the change or progreſs is made: to have an adequate idea of motion, we muſt likewiſe know *from what* it proceeds. Now it is evident that every thing exiſting, whether by nature or art, was, before it exiſted, poſſible to exiſt; and therefore, adds the ſame author, things do in ſome ſort exiſt even before they exiſt. This former kind of exiſtence is ſaid by Ariſtotle to be ἐν δυνάμει, that is, in *power* or *capacity*. In this way, plants exiſt in their ſeeds; animals in the embryo; works of art in the idea of the artiſts and the materials of which they are made; and, in general, every thing in the cauſes which produce it. From this power or capacity there is a progreſs to *energy* or actual exiſtence; ſo that we are now able to anſwer the queſtion, "*from what*, and *to what*, motion is a change?" for it is univerſally true of all *motion*, that it is a change from *capacity* to *energy*.

"Having thus diſcovered that *motion* lies betwixt *capacity* and *energy*, it is evident (he ſays) that it muſt have a connection with each of them: and from this double connection Ariſtotle has given us two definitions of it; one of them taken from the *energy*, or end to which it tends; the other from the *capacity* from which it begins. The firſt is expreſſed in two words, viz. ἐνέργεια ἀτελής, or *imperfect energy*; the other is ἐντελέχεια τοῦ ἐν δυνάμει ᾗ ἐν δυνάμει; which may be tranſlated thus, *The perfection of what is in capacity, conſidered merely as in capacity*. The meaning of the laſt words is, that nothing is conſidered in the thing that is moved but merely its *capacity*; ſo that motion is the perfection of that capacity, but not of the thing itſelf. It is ſomething more (adds the learned author) than mere *capacity*; for it is capacity exerted, which when it has attained its end, ſo that the thing has arrived at that ſtate to which it is deſtined by nature or art, ceaſes, and the thing begins to exiſt ἐνεργείᾳ, or *actually*."

189 unintelligible.

By all the admirers of Ariſtotle, this latter definition has been preferred to the former; for what reaſon, it is difficult to ſay. They both involve in the thickeſt obſcurity that which, viewed through the ſenſes, is very eaſily underſtood; and on this, as on many other occaſions, Ariſtotle was certainly guilty of darkening counſel by words without knowledge. The author, whoſe comment on this wonderful definition we have faithfully abridged, admits that it is not intelligible till we know what *change* and *progreſs* are; but is it poſſible to conceive any *change* to take place in bodily ſubſtances without *motion*? or, if we were called upon to explain what progreſs is, could we do it better than by ſaying that it is motion *from* ſomething *to* ſomething? It is likewiſe very obvious, that before we can have an adequate idea of *motion*, we muſt, according to this definition, know perfectly what the words *capacity*, *energy*, and *perfection* denote; and yet nothing can be more true than that *perfection* denotes a complex conception, which may be eaſily defined by reſolving it into the ſimple ideas and notions of which it is compounded, whilſt *motion* is ſuſceptible of no ſuch reſolution. The perfection of a knife is compounded of the temper of the ſteel and the

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the ſharpneſs of the edge; the perfection of a ſyſtem of philoſophy conſiſts of the importance of the ſubjects treated, the ſtrength of the author's arguments, and the perſpicuity of his ſtyle and manner; but of what is the *motion* of a ball, or *an atom*, or any thing elſe, compounded? We are aware that to this queſtion the modern Peripatetics will reply, that it is not the motion of a *ball*, or an *atom*, or any *one thing*, that their maſter has ſo learnedly defined, but motion abſtracted from *all individuals*, and made an object of pure intellect; and they will likewiſe affirm, that by the word *perfection* uſed in the definition, he does not mean *any one kind* of perfection as adapted to any particular *object* or *end*, but perfection abſtracted from *all objects* and *all ends*. The perfection of *nothing* and the motion of *nothing*, for ſuch ſurely are that motion and that perfection which are abſtracted from *all objects* and *ends*, are ſtrange expreſſions. To us they convey no meaning; and we have reaſon to think that they are equally unintelligible to men of greater acuteneſs (o). In a word, *motion* muſt be ſeen or felt; for it cannot be defined. To call it the *act of changing place*, or a *paſſage from one place to another*, gives no information; for *change* and *paſſage* cannot be conceived without previouſly conceiving *motion* (p).

190 Peripatetic division of motion absurd.

The Peripatetics having idly attempted to *define* motion, proceed next to *divide* it into four kinds or claſſes. This diviſion was by the father of the ſchool pretended to be made from the effects which it produces, and was ſaid by him to belong to three categories, viz. *quality*, *quantity*, and *where* (ſee CATEGORY). The firſt kind is that well known *motion* from *place* to *place*, which falls under the category laſt mentioned; the ſecond is *alteration*, by which the quality of any thing is changed, the ſubſtance remaining the ſame. This belongs to the category of *quality*. The third is *increaſe*, and the fourth *diminution*, both belonging to the category of *quantity*. The ancient atomiſts, and all the modern metaphyſicians of eminence, have with great propriety rejected this diviſion as being nothing but a collection of abſurd diſtinctions where there is in nature no difference. It has been already ſhown, that body has no other real qualities than *ſolidity*, *extenſion*, and *figure*: but of theſe the firſt cannot be altered without deſtroying the ſubſtance; for every thing which is material is equally ſolid. The extenſion of a body may indeed be enlarged, and its figure may be altered, while the ſubſtance remains the ſame; but that alteration can be made only by moving from their *places* the ſolid atoms of which the body is compoſed. Ariſtotle's ſecond kind of motion therefore differs not from the firſt; nor do the third and fourth differ from theſe two. For a body cannot be *increaſed* without acquiring new matter, nor diminiſhed without loſing ſome of the matter of which it was originally compoſed: but matter can neither be added nor taken away without motion from place to place; for there is now no creation *de novo*; and we have no reaſon to imagine that, ſince the original creation, a ſingle atom has been ever annihilated. It is therefore paſt diſpute, that local motion is the only motion conceivable; and indeed, as far as we are capable of judging from what we know of body, it is the only motion poſſible.

191 Whether, if but one body exiſted, there could be motion?

This has given riſe to a queſtion which has been debated among modern philoſophers, though, as far as we know, it was never agitated among the ancients, viz. "Whether if there were but one ſolid body exiſting, that body could poſſibly be moved." Biſhop Berkeley ſeems to be of opinion that it could not; becauſe no motion can be conceived but what has a direction towards ſome *place*, and the relation of place neceſſarily ſuppoſes the exiſtence of two or more bodies. Were all bodies, therefore, annihilated except one globe, it would be impoſſible (he thinks) to conceive that globe in motion (q.) With reſpect to

(o) "Nunc dicendum de natura motus. Atque is quidem, cum ſenſibus clare percipiatur, non tam natura ſua, quam doctis philoſophorum commentis obſcuratus eſt. Motus nunquam in ſenſus noſtros incurrit ſine mole corporea, ſpatio et tempore. Sunt tamen qui motum, tanquam ideam quandam ſimplicem et abſtractam, atque *ab omnibus aliis rebus ſejunctam*, contemplari ſtudent. Verum idea illa tenuiſſima et ſubtiliſſima *intellectus aciem eludit*: id quod quilibet ſecum meditando experiri poteſt. Hinc naſcuntur magnæ difficultates de natura motus, et definitiones, ipſa re quam illuſtrare debent longe obſcuriores. Hujuſmodi ſunt definitiones illæ Ariſtotelis et ſcholaſticorum, qui motum dicunt eſſe *actum mobilis quatenus eſt mobile*, vel, *actum entis in potentia quatenus in potentia*. Hujuſmodi etiam eſt illud viri inter recentiores celebris, qui aſſerit *nihil in motu eſſe reale præter momentaneum illud quod in vi ad mutationem nitente conſtitui debet*. Porro conſtat, horum et ſimilium definitionum auctores in animo habuiſſe abſtractam motus naturam, ſecluſa omni temporis et ſpatii conſideratione, explicare: ſed qua ratione abſtracta illa motus quinteſſentia (ut ita dicam) intelligi poſſit non video."

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(p) "Multi etiam per *tranſitum* motum definiunt, obliti ſcilicet tranſitum ipſum ſine motu intelligi non poſſe, et per motum definiri oportere: Veriſſimum adeo eſt definitiones, ſicut nonnullis rebus lucem, ita viciſſim aliis tenebras afferre. Et profecto, quaſcumque res ſenſu percipimus, eas clariores aut notiores definiendo efficere vix quiſquam potuerit. Cujus rei vana ſpe allecti res faciles difficillimas reddiderunt philoſophi, menteſque ſuas difficultatibus, quas ut plurimum ipſi peperiſſent, implicavere." *Id. ibid.*

(q) Having proved that *place*, in the proper ſenſe of the word, is merely relative, and affirmed that all *motion* is relative likewiſe, the Biſhop proceeds thus: "Veruntamen ut hoc clarius appareat, animadvertendum eſt, motum nullum intelligi poſſe ſine determinatione aliqua ſeu directione, quæ quidem intelligi nequit, niſi præter corpus motum, noſtrum etiam corpus, aut aliud aliquid, ſimul intelligatur exiſtere. Nam ſurſum, deorſum, ſiniſtrorſum, dextrorſum, omneſque plagæ et regiones in relatione aliqua fundantur, et neceſſario corpus a moto diverſum connotant et ſupponunt. Adeo ut, ſi, reliquis corporibus in nihilum redactis, globus, exempli gratia, unicus exiſtere ſupponatur; in illo motus nullus concipi poſſit: uſque adeo neceſſe eſt, ut detur

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the origin of our *ideas* of motion, his reaſoning appears unanſwerable; but we do not perceive how it concludes againſt the poſſibility of motion itſelf as exiſting in a ſingle body. It has been already ſhown in the chapter of *ſimple apprehenſion and conception*, that though nothing can be conceived which may not poſſibly exiſt, yet many things may be poſſible which we have not faculties or means to conceive. In the preſent inſtance, were this ſolitary globe animated as our bodies are, were it endowed with all our ſenſes and mental powers, it certainly would not acquire any *idea* of motion though impelled by the greateſt force. The reaſon is obvious; it would have no objects with which to compare its place and ſituation at different periods of time; and the experience of a ſhip at ſea in calm weather, affords ſufficient proof that motion which is equable cannot be perceived by any other means than by ſuch a compariſon. When the waves ſwell and the ſhip pitches, it is indeed impoſſible that thoſe who are on board ſhould not perceive that they are actually in motion; but even this perception ariſes from comparing their poſition with that of the waves riſing and falling around them: whereas in the regions of empty ſpace the animated globe could compare its poſition with nothing; and therefore, whether impelled by equal or unequal forces, it could never acquire the *idea* of motion. It may perhaps be thought, that if this ſolitary globe were a *ſelf*-moving animal, it might acquire the *idea* of motion by inferring its exiſtence from the energy which produced it. But how, we would aſk, could an animal in ſuch circumſtances be *ſelf*-moving? Motion is the effect of ſome cauſe; and it has been already ſhown (ſee n° 118. of this article), that we have no reaſon to ſuppoſe that any being can be the *real* and *primary* cauſe of any effect which that being can neither conceive nor will: but as motion can be perceived only by the ſenſes, a ſolitary animal could have no idea of motion previous to its own exertions; and therefore could neither conceive, nor will, an exertion to produce it. Let us, however, ſuppoſe, that without any end in view it might ſpontaneouſly exert itſelf in ſuch a manner as would produce *ſenſible* motion, were it ſurrounded with other corporeal objects; ſtill we may venture to affirm, that ſo long as it ſhould remain in abſolute ſolitude, the being itſelf would acquire no *idea* of motion. It would indeed be *conſcious* of the *mental* energy, but it could not infer the exiſtence of motion as a conſequence of that energy; for the idea of motion can be acquired only by ſenſe, and by the ſuppoſition there are no objects from which the ſenſes of this ſpherical animal could receive thoſe impreſſions, without which there can be no perception, and of courſe no ideas.

Let us now ſuppoſe, that, while this animated globe is under the influence either of external impulſe or its own ſpontaneous energy, other bodies are ſuddenly brought into exiſtence: would it then acquire the idea of motion? It certainly would, from perceiving its own change of place with reſpect to thoſe bodies; and though at firſt it would not perhaps be able to determine whether itſelf or the bodies around it were moving, yet a little experience would decide this queſtion likewiſe, and convince it that the motion was the effect either of its own *mental energy*, or that external *impulſe* which it had felt before the other bodies were preſented to its view. But it is obvious, that the creation of new bodies at a diſtance, can make no real alteration in the ſtate of a body which had exiſted before them: and therefore, as this animated globe would now *perceive* itſelf to be moving, we may infer with the utmoſt certainty that it *was moving* before; and that the motion of a ſingle body, though not *perceivable* by the ſenſes, might poſſibly be produced in empty ſpace.

19 Whether motion would be poſſible in ſpace abſolutely full.

Having thus ſeen that a ſingle body is capable of motion in empty ſpace, the next queſtion that occurs on this ſubject is, Whether it would be poſſible to move a body in ſpace that is abſolutely full? Such are the terms in which this queſtion is uſually put; and by being thus expreſſed, it has given riſe to the diſpute among natural philoſophers about the exiſtence of a *vacuum*. Perhaps the diſpute might have been avoided had the queſtion been more accurately ſtated. For inſtance, had it been aſked, Whether motion would be poſſible, could matter be ſuppoſed abſolutely infinite without any the leaſt interſtice or vacuity among its ſolid parts? we apprehend that every reflecting man would have anſwered in the negative. At any rate, the queſtion ought to be thus ſtated in metaphyſics; becauſe we have ſeen that ſpace, though a poſitive term, denotes nothing really exiſting. Now it being of the very eſſence of every ſolid ſubſtance to exclude from the place which it occupies every other ſolid ſubſtance, it follows undeniably, that not one particle of an infinite ſolid could be moved from its place without the previous annihilation of another particle of equal extent; but that annihilation would deſtroy the infinity. Were matter extended to any degree *leſs* than infinity, the motion of its parts would undoubtedly be poſſible, becauſe a ſufficient force could ſeparate thoſe parts and introduce among them vacuities of any extent; but without vacuities capable of containing the body to be moved, it is obvious that no force whatever could produce motion. This being the caſe, it follows, that however far we ſuppoſe the material univerſe extended, there muſt be vacuities

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detur aliud corpus, cujus ſitu motus determinari intelligatur. Hujus ſententiæ veritas clariſſima elucebit, modo corporum omnium tam noſtri quam aliorum, præter globum iſtum unicum, annihilationem recte ſuppoſuerimus.

"Concipiantur porro duo globi, et præterea nihil corporeum, exiſtere. Concipiantur deinde vires, quomodocunque applicari: quicquid tandem per applicationem virium intelligamus, motus circularis duorum globorum circa commune centrum nequit per imaginationem concipi. Supponamus deinde cœlum fixarum creari: ſubito ex concepto appulſu globorum ad diverſas cœli iſtius partes motus concipietur. Scilicet cum motus natura ſua ſit relativus, concipi non potuit priuſquam darentur corpora correlata. Quemadmodum nec ulla relatio alia ſine correlatis concipi poteſt." *De Motu*.

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vacuities in it sufficient to permit the motion of the planets and all the other heavenly bodies, which we plainly perceive to revolve round a centre: and if so, the next question to be determined is, What can *in vacuo* operate upon such immense bodies, so as to produce a regular and continued motion?

4 c- in- ot to hand t.

That all bodies are equally capable of motion or rest, has by natural philosophers been as completely proved as any thing can be proved by observation and experience. It is indeed a fact obvious to the most superficial observer; for if either of these states were essential to matter, the other would be absolutely impossible. If rest were essential, nothing could be moved; if motion were essential, nothing could be at rest, but every the minutest atom would have a motion of its own, which is contrary to universal experience. With respect to motion and rest, matter is wholly passive. No man ever perceived a body inanimated begin to move, or when in motion stop without resistance. A billiard ball laid at rest on the smoothest surface, would continue at rest to the end of time, unless moved by some force extrinsic to itself. If such a ball were struck by another ball, it would indeed be moved with a velocity proportioned to the impetus with which it was struck; but the impelling ball would lose as much of its own motion as was communicated to that upon which the impulse was made. It is evident, therefore, that in this instance there is no *beginning* of motion, but only the communication of motion from one body to another; and we may still ask, Where had the motion its origin? If the impelling ball was thrown from the hand of a man, or struck with a racket, it is plain that by a volition of the man's mind the motion was first given to his own arm, whence it proceeded through the racket from one ball to another; so that the ball, racket, and arm, were mere instruments, and the mind of the man the only agent or first mover. That motion can be *begun* by any being which is not possessed of life, consciousness, and will, or what is analogous to these, is to us altogether inconceivable. Mere matter or inanimated body can operate upon body only by impulse: but impulse, though from the poverty of language we are sometimes obliged to talk of its agency, is itself merely an effect; for it is nothing more than the contact of two bodies, of which one at least is in motion. An infinite series of effects without a cause is the grossest absurdity; and therefore motion cannot have been communicated from eternity by the impulse of body upon body, but must have been originally produced by a being who acts in a manner analogous to the energies of the human will.

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195 Motion produced by impulse can only be in a straight line.

But though motion could not have been begun but by the energy of mind, it is generally believed that it might be continued by the mere passivity of body; and it is a law of the Newtonian philosophy, that a body projected in empty space would continue to move in a straight line for ever. The only reason which can be assigned for this law is, that since body continues to move at all after the impetus of projection has ceased, it could not of itself cease to move without becoming active; because as much force is required to stop a body in motion as to communicate motion to the same body at rest. Many objections have been made to this argument, and to the law of which it is the foundation; but as we do not perceive their strength, we shall not fill our page with a formal examination of them (R). If a single body could exist and have motion communicated to it *in vacuo* by the force of projection, we are persuaded, that from the very passivity of matter, that motion would never have an end; but it is obvious that it could be moved only in a straight line, for an impulse can be given in no other direction.

196 The Newtonian doctrine respecting the causes of the motion of the heavenly bodies.

The heavenly bodies, however, are not moved in straight lines, but in curves round a centre; and therefore their motion cannot have been originally communicated merely by an impressed force of projection. This is admitted by all philosophers; and therefore the Newtonians suppose that the planets are moved in elliptical orbits by the joint agency of two forces acting in different directions. One of these forces makes the planet tend directly to the centre about which it revolves; the other impels it to fly off in a tangent to the curve described. The former they call *gravitation*, which some of them have affirmed to be a property inherent in all matter; and the latter, which is a projectile force, they consider as impressed *ab extra*. By the joint agency of such forces, duly proportioned to each other, Sir Isaac Newton has demonstrated, that the planets must necessarily describe such orbits as by observation and experience they are found actually to describe. But the question with the metaphysician is, Whether such forces be real?

197 Mutual attraction among the heavenly bodies impossible.

With respect to projection, there is no difficulty; but that bodies should mutually act upon each other at a distance, and through an immense vacuum, seems at first sight altogether impossible. If the planets are moved by the forces of gravitation and projection, they must necessarily move *in vacuo*; for the continual resistance

(R) By much the strongest and best urged of these objections which we have seen, is made by Dr Horsely, a man equally learned in mathematics and in ancient and modern philosophy. "I believe with the author of Ancient Metaphysics (says he), that some active principle is necessary for the continuance as well as for the beginning of motion. I know that many Newtonians will not allow this: I believe they are misled, as I myself have formerly been misled, by the expression *a state of motion*. Motion is a change; a continuance of motion is a farther change; a farther change is a repeated effect; a repeated effect requires a repeating cause. State implies the contrary of change; and motion being change, a *state of motion* is a contradiction in terms." See *Ancient Metaphysics*, Vol II.

If our readers think this reasoning conclusive, they may be in the right; and in that case they will see the necessity of admitting, even for the continuance of rectilineal motion, the *plastic nature*, or something equivalent to it, without which we have endeavoured to prove that the heavenly bodies could not revolve round their respective centres in elliptical curves.

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resistance of even the rarest medium would in time overcome the force of the greatest impetus: but if they move *in vacuo*, how can they be attracted by the sun or by one another? It is a self-evident truth, that nothing can act but where it is present, either immediately or mediately; because every thing which operates upon another, must perform that operation either by its own immediate agency or by means of some instrument. The sun and planets are not in contact; nor, if the motion of these bodies be *in vacuo*, can any thing material pass as an instrument from the one to the other. We know indeed by experience, that every particle of unorganised matter within our reach has a tendency to move towards the centre of the earth; and we are intuitively certain, that such a tendency must have some cause: but when we infer that cause to be a power of attraction inherent in all matter, which mutually acts upon bodies at a distance, drawing them towards each other, we talk a language which is perfectly unintelligible (s). Nay more, we may venture to affirm that such an inference is contrary to fact. The particles of every elastic fluid fly *from* each other; the flame of a fire darts *upwards* with a velocity for which the weight of the circumambient air cannot account; and the motion of the particles of a plant when growing, is so far from tending toward the *centre* of the earth, that when a flowerpot is inverted, every vegetable in it, as soon as it is arrived at a sufficient length, bends itself over the side of the pot, and grows with its top in the natural position.

198 The heavenly bodies cannot be moved by two forces impressed *ab extra*;

Sensible of the force of these arguments against the possibility of an attractive power in matter which operates at a distance, other philosophers have supposed that the heavenly bodies are moved in elliptical orbits by means of two forces originally impressed upon each planet impelling it in different directions at the same time. But if the tendency of the planets towards the centre of the sun be of the same kind with that of heavy bodies towards the centre of the earth (and if there be such a tendency at all, we have no reason to suppose it different), it cannot possibly be the effect of impulse. A body impelled or projected *in vacuo* would continue to be moved with an equable velocity, neither accelerated nor retarded as it approached the object towards which it was directed; but the velocity of a body tending towards the centre of the earth is continually accelerated: and as we cannot doubt but that the same thing takes place in the motion of a body tending towards the centre of the sun, that motion cannot be the effect of impulse or projection.

Some of the Newtonians therefore have supposed, "That all kinds of attraction consist in fine imperceptible particles or invisible effluvia, which proceed from every point in the surface of the attracting body, in all right-lined directions every way; which in their progress lighting on other bodies, urge and solicit them towards the superior attracting body; and therefore (say they) the force or intensity of the attracting power in general must always decrease as the squares of the distances increase." The inference is fairly drawn from the fact, provided the fact itself were real or possible: but it is obvious, that if fine imperceptible particles or invisible effluvia were thus issued from every point in the surface of the sun, the earth and other planets could not move *in vacuo*; and therefore the projectile motion would in time be stopped by the resistance

(s) Since this article was finished for the press, Professor Stewart's *Elements of the Philosophy of the Human Mind* have been given to the public; a work of which the merit is such as to make it painful to us to differ in any important opinion from the ingenious author. We shall, however, claim the same liberty of dissenting occasionally from him that he has claimed of dissenting from Newton, Locke, Clarke, and Cudworth, from whom he differs widely in thinking it as easy to conceive how bodies can act upon each other at a distance, as how one body can communicate motion to another by impulse. "I allow (says he, p. 79.), that it is impossible to conceive in what manner one body acts upon another at a distance through a vacuum; but I cannot admit that it removes the difficulty to suppose, that the two bodies are in actual contact. That one body may be the efficient cause of the motion of another body placed at a distance from it, I do by no means assert; but only that we have as good reason to believe that this may be possible, as to believe that any one natural event is the efficient cause of another."

If by *efficient* cause be here meant the *first* and *original* cause of motion, we have the honour to agree with the learned Professor; for we are persuaded that body inanimated is not, in this sense of the word, the cause of motion either at hand or at a distance: but if he mean (and we think he must, because such was the meaning of Newton, from whom he professes to differ), that we can as easily conceive one body to be the instrumental cause of the motion of another from which it is distant, as we can conceive it to communicate motion by impulse, we cannot help thinking him greatly mistaken. We will not indeed affirm, with the writer whom he quotes, "that although the experiment had never been made, the communication of motion by impulse might have been predicted by reasoning *à priori*;" because we are not certain, that without some such experiment we should ever have acquired adequate notions of the solidity of matter: But if all corporeal substances be allowed to be solid and possessed of that negative power to which philosophers have given the name of *vis inertiæ*, we think it may be easily proved *à priori*, that a sufficient impulse of one hard body upon another *must* communicate *motion* to that other; for when the *vis inertiæ*, by which alone the one body is kept in its place, is less than the *vis impetus* with which the other rushes to take possession of that place, it is evident that the former body *must* give way to the latter, which it can do only by motion, otherwise the two bodies would occupy one and the same place, which is inconsistent with their solidity. But that a substance possessed of a *vis inertiæ* should make another substance possessed of the same negative power quit a place to which itself has no *tendency*, is to us not only *inconceivable*, but apparently impossible, as implying a direct contradiction.

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ance of this powerful medium. Besides, is it not altogether inconceivable, nay impossible, that particles issuing *from* the sun should draw the planets *towards* that centre? would they not rather of necessity drive them to a greater distance? To say, that after they have reached the planets, they change their motion and return to the place whence they set out, is to endue them with the powers of intelligence and will, and to transform them from passive matter to active mind.

These difficulties in the theories of attraction and impulse have set philosophers upon fabricating numberless hypotheses: and Sir Isaac Newton himself, who never considered gravitation as any thing more than an effect, conjectured that there might be a very subtle fluid or ether pervading all bodies, and producing not only the motion of the planets, and the fall of heavy bodies to the earth, but even the mechanical part of muscular motion and sensation. Others (T) again have supposed fire, or light, or the electric fluid, to be the universal agent; and some few (U) have acknowledged, that nothing is sufficient to produce the phenomena but the immediate agency of mind.

With respect to the interposition of any material fluid, whether ether, fire, light, or electricity, it is sufficient to say that it does not remove any one difficulty which encumbers the theory of innate attraction. All these fluids are elastic; and of course the particles of which they are composed are distant from each other. Whatever motion, therefore, we may suppose to be given to one particle or set of particles, the question still recurs, How is it communicated from them to others? If one body can act upon another at the distance of the ten-thousandth part of an inch, we can perceive nothing to hinder its action from extending to the distance of ten thousand millions of miles. In the one case as well as the other, the body is acting where it is not present; and if that be admitted to be possible, all our notions of action are subverted, and it is vain to reason about the cause of any phenomenon in nature.

200
The hypothesis of Plato, Aristotle, and Cudworth,

This theory of the intermediate agency of a subtle fluid differs not essentially from the vortices of Des Cartes; which appeared so very absurd to Cudworth, that with a boldness becoming a man of the first genius and learning, he rejected it, and adopted the plastic nature of Plato, Aristotle, and other Greek philosophers. That incomparable scholar observes, that matter being purely passive, the motion of the heavenly bodies, the growth of vegetables, and even the formation of animal bodies, must be the effect either of the immediate agency of God, or the agency of a *plastic nature* used as an instrument by divine wisdom. That they are not the effect of God's immediate agency, he thinks obvious from several circumstances. In the first place, they are performed slowly and by degrees, which is not suitable to our notions of the agency of almighty Power. Secondly, Many blunders are committed in the operations of nature, such as the formation of monsters, &c. which could never be were things formed by the immediate hand of God. He is therefore of opinion, that, after the creation of matter, God employed an inferior agent to give it motion and form, and to carry on all those operations which have been continued in it since the beginning of the world. This agent he calls *plastic nature;* and considers it as a being incorporeal, which penetrates the most solid substance, and, in a manner which he pretends not to explain otherwise than by analogy, actuates the universe. He does not look upon it as a being endued with perception, consciousness, or intelligence; but merely as an instrument which acts under divine wisdom according to certain laws. He compares it to art embodied; and quoting from Aristotle, says, Ει ενην εν τω ξυλω ἡ ναυπηγικη ὁμοιως αν τῃ φυσει εποιει· *If the art of the shipwright were in the timber itself, operatively and effectually, it would there act just as nature doth.* He calls it a certain lower life than the animal, which acts regularly and artificially for ends of which it knows nothing. It may be, he says, either a lower faculty of some conscious soul, or else an inferior kind of life or soul by itself, but depending in either case upon a higher intellect. He is aware with what difficulty such a principle will be admitted by those philosophers who have divided all being into such as is extended and such as is cogitative: but he thinks this division improper. He would divide beings into those which are solid and extended, and those which have life or internal energy. Those beings which have life or internal energy he would again divide into such as act with consciousness, and such as act without it: the latter of which is this plastic life of nature. To prove that such an instrument is possible, or that a being may be capable of operating for ends of which it knows nothing, he instances *bees* and other animals, who are impelled by *instinct* to do many things necessary to their own preservation, without having the least notion of the purpose for which they work. (See INSTINCT.) He observes, that there is an essential difference between reason and instinct, though they are both the attributes of mind or incorporeal substance: and that therefore, as we know of two kinds of mind differing so widely, there is nothing to hinder us from inferring a third, with powers differing as much from instinct as instinct differs from reason. Mankind are *conscious* of their own operations, *know* for what *purpose* they generally act, and can by the power of *reflection* take a *retrospective* view of their actions and thoughts, making as it were the mind its own object. Brutes are *conscious* of their own operations, but they are ignorant of the *purposes* for which they operate, and altogether *incapable* of *reflecting* either upon their past conduct or past thoughts. Between their intellectual powers and those of man, there is a much greater difference than there is between them and a plastic nature, which acts as an instrument of divine wisdom without any consciousness of its own operations. Aristotle, from whom principally the

(T) The several followers of Mr Hutchinson.
(U) Cudworth, Berkeley, and the author of Ancient Metaphysics.

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the learned author takes his notion of this plastic nature, compares it, with respect to the divine Wisdom which directs and superintends its operations, to a mere builder or mechanic working under an architect, for the purpose of which the mechanic himself knows nothing. The words of the Stagyrite are: Τους αρχιτεκτονας περι εκαστον τιμιωτερους και μαλλον ειδεναι νομιζομεν των χειροτεχνων, και σοφωτερους ὅτι τας αιτιας των ποιουμενων ισασιν οἱ δ' ὥσπερ και των αψυχων ενια, ποιει μεν, ουκ ειδοτα δε ποιει, οἷον καιει το πυρ· τα μεν ουν αψυχα φυσει τινι ποιειν τουτων εκαστον τους δε χειροτεχνας δι εθος *. "We account the architects in every thing more honourable than the mere workmen, because they understand the reason of the things done; whereas the other, as some inanimate things, only work, not knowing what they do, just as the fire burns: the difference betwen them being only this, that inanimate things act by a certain nature in them, but the workman by habit."

* Metaphys. Lib i. chap. 1.

201 Shown to be possible.

Still further to prove that a being may be endowed with some vital energy of a subordinate kind, and yet be destitute of consciousness and perception, the learned author observes, that there is no reason to think that the souls of men in sound sleep, lethargies, or apoplexies, are conscious of any thing; and still less, if possible, to suppose that the souls of embryos in the womb are from the very first moment of their arrival there intelligent and conscious beings: neither can we say, how we come to be so differently affected in our souls by the different motions made upon our bodies, nor are we conscious always of those energies by which we impress fantastic ideas on the imagination. But if it be possible for the souls of men to be for one instant void of consciousness and intelligence, it follows, that consciousness is not absolutely necessary to those energies and motions by which life is preserved. To this it may be added, upon the best authority ‡, "that where animal or vegetable life is concerned, there is in every case a different relation between the cause and effect, and seemingly depending upon the concurrence or influence of some farther principle of change in the subject, than what subsists in inanimate matter, or in the causes and effects that are the objects of mechanichal and chemical philosophy." Now to this principle of vegetable life, without which, in a seed or in a plant, vegetation will neither begin nor continue, tho' light, heat, air, earth, and water, should concur in the utmost perfection, Cudworth expressly compares his plastic nature in the universe. It is so far (says he) from being the first or highest life, that it is indeed the last and lowest of all lives, being really the same thing with the vegetative.

‡ Gregory's Philosophical and Literary Essays.

202 Argument for it; but

These arguments, if the phenomena of elective attractions in chemistry be added to them, demonstrate, we think, the *possibility* of such a principle: and to those who are inclined to affirm that no such thing can exist, because, according to the description of it given by Cudworth and the ancients, it is neither body nor spirit, in the proper sense of the words; we beg leave to ask in the words of Locke, "Who told them that there is and can be nothing but solid beings which cannot think, and thinking beings that are not extended? which is all that they mean by the terms body and spirit." All the Greek philosophers who were not materialists, and even the inspired writers of the Old and New Testaments, constantly distinguish between the *spirit* and the *soul* of a man, calling the former sometimes νους and sometimes πνευμα, and the latter ψυχη; and St Paul, who before he was a Christian was learned in philosophy, describes the constituent parts of man as three, πνευμα, ψυχη, σωμα, *spirit*, *soul*, and *body*. This distinction, setting aside the *authority* with which it comes to us, seems to be well founded; for there are many operations carried on in the human body without any conscious exertion of ours, and which yet cannot be accounted for by the laws of mechanism. Of these, Cudworth instances the motion of the diaphragm and other muscles which causes respiration, and the systole and diastole of the heart; neither of which, he thinks, can be the effect of mere mechanism. But, as we are not conscious of any energy of soul from which they proceed, even while we are awake, and still less, if possible, while we are asleep; he attributes them, not to the intellect or rational mind, but to this inferior vital principle called ψυχη (v); which, in his opinion, acts the

(v) The existence of this plastic nature was warmly debated between Monsieur Le Clerc and Monsieur Bayle. Mosheim, who was inclined himself to admit such a principle, gives the following view of Le Clerc's sentiments from *Bibliotheque choisie*, tom. ii. p. 113. "Respiratio, inquit et motus cordis, actiones sunt, quorum nihil ad animam pertinet. Interim mechanice eas fieri, nullo modo probabile est. In voluntariis commotionibus nesciunt animi nostri, quid facto opus sit, ut membra commoveantur: imperant illi tantum. Est vero aliud nescio quid, quod fideliter, si modo organa recte sint affecta, mandata ejus exsequitur. Quidni igitur suspicemur, esse *naturam* in corpore nostro *viventem*, præter animam nostram, cujus sit animæ præceptis et jussis morem gerere? quamquam potentia ejus ita sit definita, ut obedire nequeat animo, nisi recte sese habeant organa. Eadem forte natura, corporis nostri motibus impulsa, animam edocet, quid factum sit, ut ille possit præcipere, quæ ad conservationem corporis necessaria judicat. Anima, pergit, si hæc vera esse putes, similis erit domino, sibimet ipsi servire nescio, nec ulla facultate alia, quam imperandi et jubendi instructo. Hæc vero natura fictrix non dissimilis erit mancipii cui nihil eorum, quæ dominus meditatur, notum est, quodque nihil aliud facit, quam ut jussis pareat, et dominum de illis rebus admoneat, quæ ad salutem ipsius pertinent." Mosheim proceeds,—Si quis huic loco sic occurrat, Hæc ratione tria fingi in homine principia; respondet vir doctus: "Nullis constares argumentis, binis tantum hominem partibus constare. Eos, qui hominem ex binis tantum partibus component, nulla ratione explicare posse naturam conjunctionis animi et corporis, nisi ipsum Deum statuant cunctis actionibus hominum intervenire: hoc vero Divina Majestate prorsus indignum esse. Definitionem accuratam mediæ hujus naturæ postulantibus sese talem dare non posse definitionem respondet: Hoc unum sese scire: esse eam naturam interiori agendi virtute instructam, quæ ex se et animam et corpus afficere queat; naturam, quæ doceat animam quid rerum

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the same part in the system of the human body which the plastic nature acts in the system of the world.—To make the resemblance more striking, he observes, that even the voluntary motion of our limbs, though it proceeds ultimately from an energy of will, seems to be the effect of that energy employing some *instrument* which pervades the sinews, nerves, and muscles of the body; and if the human spirit or πνευμα employ the instrumentality of a plastic nature or ψυχη in moving the small machine of the body, it seems to be far from incredible that the Divine Wisdom should employ the instrumentality of a plastic nature in moving the great machine of the universe.

103 Whether it be necessary for the motions of the heavenly bodies are carried on by the agency of some e-thing immaterial.

But we need not insist further on the *possibility* of such an instrument. Whatever may be thought of the arguments of Cudworth, of which some are, to say the least of them, plausible, though others appear to us to have very little strength, Dr Clarke has proved, with a force of reasoning not inferior to mathematical demonstration, that the motions of the heavenly bodies are carried on by the agency of something very different from matter, under every possible form. "For, not to say that, seeing matter is utterly incapable of obeying any *laws* in the proper sense of the word, the very original laws of motion themselves cannot continue to take place, but by something superior to matter, *continually* exerting on it a certain force or power according to such certain and determinate laws; it is now evident beyond question, that the bodies of all *plants* and *animals* could not possibly have been formed by mere matter according to any general laws of motion. And not only so, but that most universal principle of *gravitation* itself, the spring of almost all the great and regular inanimate motions in the world, answering not at all the *surfaces* of bodies, by which alone they can act upon one another, but entirely to their *solid contents*, cannot possibly be the result of any motion originally impressed upon matter." For though it is true, that the most solid bodies with which we are acquainted are all very porous; and that, therefore, a subtle material fluid might penetrate the bodies of the planets, and operate upon them with a force exerted internally; still it is self-evident, that the *greatest* quantities of such a fluid could not enter into those bodies which are *least* porous, and where the greatest force of *gravitation* resides: "and, therefore, this motion must of necessity be caused by something which penetrates the very *solid substance* of all bodies, and continually puts forth in them a force or power entirely different from that by which matter acts upon matter †." Which is, as the same able writer observes, an evident demonstration, not only of the world's being originally made by a supreme intelligent Cause; but moreover, that it depends every moment upon some superior Being, for the preservation of its frame; and that all the great motions in it are caused by some immaterial power *perpetually* and *actually* exerting itself every moment in every part of the corporeal universe. This preserving and governing power, whether it be the immediate power and action of the same Supreme Cause that created the world, or the action of some subordinate instruments appointed by him to direct and preside respectively over certain parts thereof, gives us equally in either way a very noble idea of Providence. We know with certainty, that *real* and *original power* can belong only to a being endowed with intelligence and will; and, therefore, if the existence of Cudworth's (w) plastic nature be

† *Evidence of Nat. and Reveal'd Religion.*

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rerum geratur in corpore; naturam denique, quæ animi mandatis, quorum tamen caussas nesciat, fideliter obtemperet." Reliqua, quæ illustrandæ hujus rei caussa CLERICUS affert, prætereo. Satis copiosa est in illis, quæ produximus, meditandi materia. *Mosheim. ed. Syst. Intellect.* p. 173.

Such a principle actuating the universe, if it be divested of intelligence, and considered as a second or inferior cause, under the direction of the Supreme, is acknowledged by a very able judge to be a rational hypothesis; and such, if properly pursued, would certainly open a most entertaining scene of natural philosophy. See *Jones's Answer to an Essay on Spirit.*

(w) Besides Cudworth, we have mentioned Berkeley and the author of *Ancient Metaphysics*, as holding all motion to be an effect of the immediate agency of mind or incorporeal substance. The opinion of the last of these philosophers is not essentially different from Cudworth's; and therefore it is needless to quote from him: Berkeley was better acquainted with the principles of the Newtonian philosophy, as well as an abler mathematician, than either of these pupils of the ancients; and being likewise a man who on all subjects thought for himself, it may be worth while to lay before our readers a short abstract of his reasoning respecting the origin of motion. His words are: "Totum id quod novimus, cui nomen *corpus* indidimus, nihil in se continet quod motus principium seu causa efficiens esse possit. *Vis*, *gravitas*, *attractio*, et hujusmodi voces, utiles sunt ad ratiocinia et computationes de motu et corporibus motis; sed non ad intelligendam simplicem ipsius motus naturam, vel ad qualitates totidem distinctas designandas. Attractionem certe quod attinet, patet illam ab Newtono adhiberi, non tanquam qualitatem veram et physicam, sed solummodo ut hypothesin mathematicam. Quin et Leibnitius, nisum elementarem seu solicitationem ab impetu distinguens, fatetur illa entia non re ipsa inveniri in rerum natura, sed abstractione facienda esse. Similis ratio est compositionis et resolutionis virium quarumcunque directarum in quascunque obliquas, per diagonalem et latere parallelogrammi. Hæc mechanicæ et computationi inserviunt: sed aliud est computationi et demonstrationibus mathematicis inservire, aliud rerum naturam exhibere. Revera corpus æque perseverat in utrovis statu, vel motus vel quietis. Ista vero perseverantia non magis dicenda est actio corporis, quam existentia ejusdem actio diceretur. Cæterum resistentiam, quam experimur in sistendo corpore moto, ejus actionem esse fingimus vana specie delusi. Revera enim ista resistentia quam sentimus, passio est in nobis, neque arguit corpus agere, sed nos pati: constat utique nos idem passuros fuisse, sive corpus illud a se moveatur, sive ab alio principio impellatur.—Actio et reactio dicuntur esse in corporibus: nec incommode ad demonstrationes mechanicas. Sed cavendum, ne propterea suppo-

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be admitted, (and we see not (x) why it should be called in question), it can be considered only as an instrument employed by Divine Wisdom, as a chizzel or a saw is employed by the wisdom of the mechanic.

204 This theory not inconsistent with the principles of Newton.

Nor let it be imagined, that this ancient theory of motion is in any degree inconsistent with the mathematical principles of Sir Isaac Newton's astronomy, or with the calculations raised from those principles. Having founded his astronomy on analogy between the phænomena of projectile and planetary motions, he assigned the same or similar *forces* existing in nature as the efficient causes of both. And indeed, both in the act of deriving his *principles* from the projectile phenomena, and afterwards for the purpose of applying them to the planetary, it was necessary to analyze the elliptical motion of the heavenly bodies into a compound of two simple motions in right lines, produced by the action of these different forces; and this might also be useful for the purposes of teaching and demonstration, just as we find it necessary, in all parts of science, to separate what in nature is inseparable, for the convenience and assistance of the understanding. The planetary motions, however, are very probably simple and uncompounded, for no experiments can be tried in those distant regions; and the astronomy of Newton, which is only the application of his mathematical principles to their mensuration from their *analogy* to projectile motions, does not at all require that the forces of gravitation and projection be assigned as their real existent causes (Y). It is sufficient for the *analogy*, on which the whole philosophy is founded, that the phenomena of motion are known from experiments and observations to be the *same* in *both* instances; that the *principles* or *general laws* mathematically established from the *forces* of the *one* are transferred to the *phenomena* of the *other*; and that the proofs and operations deduced from these principles in the latter case, are confirmed by *facts* and *experience*, the first and final test of truth.*

* Tatham's Chart and Scale of Truth.

CHAP. VI. *Of* NUMBER.

205 Unity an idea, cannot

" AMONGST all the ideas that we have, as there is none (says Mr Locke‡) suggested to the mind by more ways, so there is none more simple than that of UNITY or one. It has no shadow of variety or composition in it. Every object our senses are employed about, every idea in our understandings, every thought of our minds, brings this idea along with it: and there-

‡ Essay, Book ii. chap. 16

supponamus virtutem aliquam realem, quæ motus causa sive principium sit, esse in iis. Etenim voces illæ eodem modo intelligendæ sunt ac vox *attractio*: et quemadmodum hæc est hypothesis solummodo mathematica, non autem qualitas physica; idem etiam de illis intelligi debet, et ob eandem rationem.

" Auferantur ex idea corporis extensio, soliditas, figura, remanebit nihil. Sed qualitates istæ sunt ad motum indifferentes, nec in se quidquam habent, quod motus principium dici possit. Hoc ex ipsis ideis nostris perspicuum est. Si igitur voce *corpus* significatur id quod concipimus, plane constat inde non peti posse principium motus: pars scilicet nulla aut attributum illus causa efficiens vera est, quæ motum producat. Vocem autem proferre, et nihil concipere, id demum indignum esset philosopho.

" Præter res corporeas, alterum est genus rerum cogitantium: in iis autem potentiam inesse corpora movendi, propria experientia didicimus, quando quidem anima nostra pro lubitu possit ciere et sistere membrorum motus, quacunque tandem ratione id fiat. Hoc certe constat, corpora moveri ad nutum animæ, eamque proinde haud inepte dici posse principium motus; particulare quidem et subordinatum, quodque ipsum dependeat, a primo et universali principio.

" Ex dictis manifestum est eos qui vim activam, actionem, motus principium, in corporibus revera inesse affirmant, sententiam nulla experientia fundatam amplecti, eamque terminis obscuris et generalibus adstruere, nec quid sibi velint satis intelligere. E contrario, qui mentem esse principium motus volunt, sententiam propria experientia munitam preferunt, hominumque omni ævo doctissimorum suffragiis comprobatam.

" Primus Anaxagoras τον νουν introduxit, qui motum inerti materiæ imprimeret: quam quidem sententiam probat etiam Aristoteles, pluribusque confirmat, aperte pronuncians primum movens esse immobile, indivisibile, et nullum habens magnitudinem. Dicere autem, omne motivum esse mobile, recte animadvertit idem esse ac siquis diceret, omne ædificativum esse ædificabile. Plato insuper in Timæo tradit machinam hanc corpoream, seu mundum visibilem, agitari et animari a mente, quæ sensum omnem fugiat. Et Newtonus passim nec obscure innuit, non solummodo motum ab initio a numine profectum esse, verum adhuc systema mundanum ab eodem actu moveri. Hoc sacris literis consonum est: hoc scholasticorum calculo comprobatur."

De Motu, passim.

(x) This we say upon the received opinion, that there are beings wholly incorporeal. The truth of the opinion itself will be considered in a subsequent chapter.

(Y) Indeed Sir Isaac himself is very far from positively assigning them as the *real* causes of the phenomena. The purpose for which they were introduced into his philosophy he clearly explains in the following words: " Eadem ratione qua projectile vi gravitatis in orbem flecti posset et terram totam circumire, potest et luna, vel vi gravitatis, *si modo gravis sit*, vel alia quacunque vi qua in terram urgeatur, retrahi semper a cursu rectilineo terram versus et in orbem suum flecti: et absque tali vi luna in orbe suo retineri non potest. Hæc vis, si *justo minor* esset, non satis flecteret lunam a cursu rectilineo; si *justo major*, plus satis flecteret, ac de orbe terram versus deduceret. Requiritur quippe ut sit *justæ magnitudinis*: et mathematicorum est invenire vim, qua corpus in dato quovis orbe data cum velocitate accurate retineri possit; et vicissim invenire viam curvilineam, in quam corpus e dato quovis loco data cum velocitate egressum data vi flectatur."——*Principia Mathem.* Def. V.

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therefore it is the most intimate to our thoughts, as well as it is, in its agreement to all other things, the most universal idea we have; or number applies itself to men, angels, actions, thoughts, every thing that either doth exist or can be imagined. "He seems likewise to be of opinion that we have the idea of *unity* before that of *many;* and that it is by repeating the simple idea of unity in our own minds that we come by the *complex ideas* of *two, three,* &c." In this opinion he is joined by Pere Buffier *; who observes that it is impossible to explain the nature of *unity,* because it is the most simple idea, and that which perhaps *first* occurred to the mind.

That *unity* is a simple idea, must be granted; but it certainly did not first occur to the mind, nor can it be abstracted from all individuals, and apprehended in Locke's sense of the word as a *general idea.* Let any man look into his own mind, and then say whether he has a general idea of *one* or *unity* as abstracted from every individual object mental and corporeal. In particular, when he thinks he has completely abstracted it from body and mind, sensations, ideas, actions, and passions, &c. let him be sure, before he pronounce it a general *abstract* idea, that he is not all the while contemplating the idea of its *name,* or of that numerical *figure* by which it is marked in the operations of arithmetic. Both these ideas are in themselves particular; and become general in their import, only as representing every individual object to which unity is in any sense applicable. But in the chapter *of abstraction,* we have said enough to convince every person capable of conviction that they are used as signs for whole classes of objects.

Instead of being an abstract general idea, *unity,* as the basis of number, is in fact nothing but a mere *relation,* which cannot be conceived without the related objects; and so far is it from being the *first* idea that occurred to the mind, that it is certainly the result of a comparison, made by the intellect, of two or more objects. The ideas which first occur to the mind are, beyond all doubt, those which are called *ideas of sensation;* and many such ideas every child receives before he is capable of comparing objects and forming to himself notions of number. *Unity,* or the idea of *one,* is indeed the element of the science of *arithmetic,* just as a mathematical *point* is the element of the science of *geometry;* but accurate notions of these elements are, in the progress of knowledge, subsequent to ideas of *many* and of *surfaces.* There is reason to believe that persons totally illiterate have no notion at all of *mathematical points;* and we think it possible to conceive an intelligent and conscious being in such a situation as that he could not acquire a notion of *unity* or *one.* Were a child never to see or feel two objects of the *same kind,* we doubt if he would think of numbering them, or of making such a comparison of the one with the other as would suggest to his mind the relations of *one* and *two;* for these relations imply both a sameness and a difference of the objects beyond the power of a child to ascertain. The difference indeed would be perceptible to the senses, but the senses would perceive no sameness or agreement. A guinea, a shilling, and a ball of lead, impress upon the mind different sensations; and therefore a child undoubtedly distinguishes these objects from one another: but what could make him derive from them his first idea of the relation of number? A guinea, a shilling, and a ball of lead, are not *one, two, three,* in any sense which a child can comprehend. To be convinced of this, let any man throw a guinea, a shilling, and a ball of lead upon a table, and ask a *clown* what is their number. From being accustomed to retail the *names* of number as signs, without affixing to them any idea of the things signified, he will probably answer with quickness *three,* or perhaps *one, two, three:* but if he be further asked in what *respect* they are *one, two, three,* we believe his answer will not be so ready: They are not *one, two, three guineas,* or *shillings,* or *balls of lead.* A philosopher knows them to be three pieces of the same first matter under different forms, and can therefore apply to them the relation of number with truth and propriety; but of the first matter a *clown* is entirely ignorant, and of course cannot call them *one, two, three,* in any sense which is at once true and to him intelligible.

To make it still more evident, that it is only by comparing together things of the *same kind* that our *first* ideas of unity and number are formed, let us suppose no created being to have hitherto existed except the animated and intelligent globe mentioned in the last chapter, and we think it will be granted that such a being in solitude could never acquire the idea of *unity.* Let us next suppose a *cubical* body to be created and exhibited to the senses of this spherical man; the consequence would be a *sensation* or feeling entirely new: but that feeling would not be of *unity;* for, as the author of *Ancient Metaphysics* has somewhere well observed, unity is no object of sensation. The sensation would be of colour, hardness, softness, roughness or smoothness, &c. for beyond these the empire of the senses does not reach. Again, let another body be created of a colour and figure totally different from the colour and figure of the cube, and the spherical man would then experience new sensations having no agreement with those which he had formerly felt. These different kinds of sensations might be compared together; but the result of the comparison would not be the ideas which are denoted by the words *one* and *two,* but merely that which is expressed by *difference* or *dissimilarity.* Were another cube, however, of exactly the same size and colour with the former to be brought into existence, and both to be at once presented to the view of the spherical man, the rudiments of the idea of number would then be generated in his mind, because he could not but perceive the cubes to be in one respect different and in another the same; different as being distinct from each other, and agreeing in their effects upon the organs of sensation.

208
Men must have made some progress in classing things according to genera and species, before they acquired any notion of number.

It appears, therefore, that mankind must have made some progress in classing things according to their genera and species, before they acquired any correct ideas of the relation of number, or thought of using numerical names or figures as general and discriminating signs: for we say *one, two, three,* &c. only with respect to the species or genus of which each of the things denoted by these numbers is an individual; and if there be any thing which has no genus or species, neither number nor unity can, in the original sense of the

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the words, be predicated of it (z). We say indeed that there is *one* God; but perhaps we do not always attend to the meaning of the expression. Language was formed to answer the common purposes of life; and those purposes are best answered by denoting individuals by the name of the species or genus to which they belong: but *God* belongs to no species or genus, unless he be said improperly (A) to be of the universal genus of *Being*; and therefore the true meaning of the word *one*, when joined to the verb *is*, and transferred from the creature to the Creator, in such a sentence as—"there *is one* God"—seems to be nothing more than an affirmation that God exists, and that to him the relation of number cannot be applied. In a word, *unity* and *number* are merely relations between the individuals of the same species or genus of being; and men acquire ideas of these relations at the same time and by the same means that they are led to class things into species and genera. As to the processes of addition and subtraction, and the various purposes to which number is applied, these things belong to the science of arithmetic, and fall not under the province of the metaphysician, whose sole object is to ascertain the real nature and causes of things. It may, however, be worth while to observe, that Locke, whose notions of number seem to have been different from ours, owns, that a man can hardly have any ideas of numbers of which his language does not furnish him with names. But if units were either real things, or even positive ideas, we see not how *names* could be necessary to their existence; whereas, if they be nothing more than mere relations, it is obvious that they cannot be conceived but as relative either to beings actually existing, or to names which are the signs of actual beings.

Chap. VII. *Of* Time.

209 Time, a mode of duration in contradistinction to eternity.

When St Augustine was asked what time is? he replied, "*Si non roges, intelligo.*" An answer from which it may be inferred, that he thought the nature of *time* could not be explained by a logical definition. *Time* and *eternity* are commonly considered as the two modes of *duration*; and if duration be taken in what Locke thinks its true and original sense, to denote permanence of existence with a kind of resistance to any destructive force, the distinction seems to be sufficiently proper. It is indeed the best that we can make or comprehend; for *duration*, *time*, and *eternity*, are subjects which have perplexed philosophical minds in all ages, and of which if we have adequate notions, it is very difficult to express these notions in language. Instead of attempting it by previous definitions, the method in which the ancients generally began their inquiries, we shall pursue the better course of induction recommended by Lord Bacon, and endeavour to show by what means we acquire the notion of that mode of duration which is called *time* in contradistinction to *eternity*. We begin with time; because we ourselves exist in it, and it is in some sense familiar to us. If we be able to trace our notions of this mode of duration to their source, we may then give a definition of it founded on fact and universal experience, and afterwards proceed to consider the other mode in conjunction with infinity, to which it is nearly allied.

It has been already observed (see n° 93 of this article), that every man, while awake, has a train of sensations and ideas constantly passing through his mind, in such a manner as that the one succeeds the other in a regular order. It is not possible, either, by detaining in the mind one idea to the exclusion of all others, to stop the course of this succession entirely; or, by hurrying some ideas off the stage, and calling others in their place, to quicken its progress beyond a certain degree. One man indeed has naturally a quicker succession of ideas than another; and all men can, by great exertions, accelerate or retard in a small degree the natural flow of their thoughts. A studious man lays hold, as it were, of a particular idea, which he wishes to contemplate, and detains it in the imagination, to the exclusion of all others; a man of wit calls remote ideas into view with a rapidity of which a cool and phlegmatic reasoner can form no conception; and a forcible *sensation* takes full possession of the mind, to the exclusion of all *ideas* whatever. Whilst the attention is wholly occupied by one idea, or by one sensation, the mind has no notion whatever of time; and were it possible to detain such idea or sensation alone in the mind till the hand of a clock should move from the number of one hour to that of another, the hour, as marked on the dial-plate and measured by the motion of the hand, would appear but as one instant absolutely void of duration. For the truth of this assertion we appeal to the experience of our readers. Such of them as have ever been engaged in deep study must often have had their attention

210 Whilst the mind is occupied by one idea or notion, there is no perception of time which

(z) We are happy to find our notions on this subject confirmed by an authority so respectable as that of Professor Stewart. "Without the power of attending separately to things which our senses present to us in a state of union, we never (says this able writer) could have had any idea of *number*: for before we can consider different objects as forming a multitude, it is necessary that we should be able to apply to all of them one common name; or, in other words, that we should reduce them all to the same genus. The various objects, for example, animate and inanimate, which are at this moment before me, I may class and number in a variety of different ways, according to the view of them that I choose to take. I may reckon successively the number of sheep, of cows, of horses, of elms, of oaks, of beeches; or I may first reckon the number of animals, and then the number of trees; or, I may at once reckon the number of all the organized substances which my senses present to me. But whatever be the principle on which my classification proceeds, it is evident that the objects numbered together must be considered in those respects only in which they agree with each other; and that if I had no power of separating the combinations of sense, I never could have conceived them as forming a plurality." *Elements of the Philosophy of the Human Mind*, chap. iv.

(A) We say *improperly*, because beings which were *created* can have nothing in *common* with that being which is *self-existent*, and upon whose *will* and *power* all other things depend.

attention ſo fixed upon one object, that large portions of time, as meaſured by the clock, have paſſed away wholly unheeded; and every man who has ſeen a very ſtriking and uncommon object, muſt remember, that when the ſenſation was firſt impreſſed upon his mind, all other objects, ideas, and notions, and among the reſt the notion of time, were for a while excluded.

No ſenſation, however, keeps poſſeſſion of the whole mind after it has ceaſed to be new; nor can the moſt vigorous exertions long preſerve any one idea from being driven off the ſtage by the ſucceeding train. Now this ſucceſſion of ideas appearing and diſappearing in their turns, is that which, when compared with the permanency of ourſelves and other things, gives us our firſt and juſteſt notion of time: for whilſt we are thinking, or whilſt a ſeries of ideas is ſucceſſively paſſing through our minds and vaniſhing, we know that we ourſelves and the things around us exiſt; and this exiſtence, or continuation of exiſtence, commenſurate with the train of our fleeting ideas, is what we call the *duration* of ourſelves and the things around us.

We are aware that our firſt notions of time have been often ſaid to be derived from *motion* as perceived by our ſenſes in the objects around us. It is obſerved by Euclid, that "if there were no *motion*, there could be no ſound, nor any ſenſe of hearing." "He might have added (ſays the author of Ancient Metaphyſics), nor any other perception of ſenſe. Further, without motion there would have been no viſible world, nor generation or production of any kind here below; and, among other things, *time* could have had no exiſtence." All this is certainly true; but that corporeal motion, though the original ſource of all our ideas, is not that which *immediately* ſuggeſts to us the notion of time, will be readily granted by him who conſiders that motion itſelf is perceived by us only when it excites or accompanies a conſtant ſucceſſion of perceptions and ideas. Motion, when equable and very ſlow, ſuch as that of the hour-hand of a common watch, is not perceived by us in its courſe; nor can we diſcover that the thing has moved at all, till after we have been ſenſible of the lapſe of a conſiderable portion of what is commonly called *time;* when we diſcover that the hand of the watch has changed its place with reſpect to other objects which we know to be fixed. The ſame is true of motion remarkably quick: "Let a cannon-ball (ſays Locke) paſs through a room, and in its way take with it any limb or fleſhy parts of a man; it is as clear as any demonſtration can be, that it muſt ſtrike ſucceſſively the two ſides of the room: it is alſo evident that it muſt touch one part of the fleſh firſt, and another after, and ſo in ſucceſſion: and yet I believe nobody who ever felt the pain of ſuch a ſhot, or heard the blow againſt the two diſtant walls, could perceive any ſucceſſion either in the pain or ſound of ſo ſwift a ſtroke."

Of theſe two phenomena a ſatisfactory account may be eaſily given; from which we think it will at the ſame time be apparent, that the ſucceſſion of the train of ideas in the mind is the meaſure and ſtandard of all other ſucceſſions. We know that the energy of mind which reviews a train of ſenſible ideas is of the very ſame kind with that which attends to a ſeries of paſſing ſenſations (ſee n° 69); and therefore it is natural to ſuppoſe that we can pay attention to ſenſations and ideas paſſing with nearly equal velocities. But it has been ſhown, that every ſenſation remains in the mind or ſenſorium for a very ſhort ſpace after the object which excited it is taken away: whence it follows, that a body communicating to the organs of ſenſe a ſeries of ſimilar impreſſions ſucceeding each other with remarkable rapidity, cannot excite a train of ſimilar and diſtinct ſenſations; becauſe the effects of the firſt and ſecond impreſſions not having vaniſhed when thoſe of the third and fourth arrive, the whole train of effects muſt neceſſarily coaleſce into one uniform ſenſation. This reaſoning is confirmed by experience. Similar ſounds ſucceeding each other at conſiderable intervals, are all diſtinctly perceived; and if the motion be accelerated gradually, it may be carried to a great degree of velocity before the ſounds be confounded and coaleſce into one. "Mr Herſchel having, by means of a clock, produced ſounds or clicking noiſes, which ſucceeded each other with ſuch rapidity that the intervals between them were, as far as could be judged, the ſmalleſt poſſible, found that he could evidently diſtinguiſh one hundred and ſixty of them in a ſecond of time; but beyond that he could by no effort of attention diſtinguiſh one ſound from another. The ſame philoſopher tried another experiment on viſible ſenſations. By means of the ſame handle and work of the clock, he cauſed a wheel in it to turn till it acquired the velocity of once in a ſecond. He continued to increaſe the velocity, and obſerved it while revolving at the rate of twenty times round in thirteen ſeconds, and could ſtill diſtinguiſh the teeth and ſpaces from each other; whence it appears (by a computation given at length), that he had two hundred and forty-ſix diſtinct viſible ſenſations generated by equable motion in a ſecond of time. The teeth of the wheel, he owns, were not ſo far viſible as to ſhow their ſhape diſtinctly, much leſs could they have been counted: but he very plainly diſtinguiſhed the circumference to be divided into teeth and ſpaces; and he ſuppoſes that the ſame diviſion might ſtill have been ſeen though the motion had been a little faſter, as far perhaps as two turns in a ſecond, equal to three hundred and twenty ſenſations *." The reaſon that the diviſion could not be ſeen whilſt the wheel moved more rapidly than twice round in a ſecond of time, was doubtleſs the continuance of that agitation in the brain from which each ſenſation proceeded, until a new impreſſion cauſed a new agitation, which coaleſced with the former and removed all diſtinction. Hence it is plain, that no external ſucceſſion can be perceived which moves with a greater velocity than that of which the internal train of ſenſations and ideas is capable. On the other hand, an external ſucceſſion which moves with leſs rapidity than that to which the internal flow of ideas may be reduced, either has not ſufficient force to generate ſenſations at all, or the ſucceſſive impreſſions from which the ſenſations proceed follow one another at ſuch diſtances as to permit the natural train of ideas to intervene between them, and thus deſtroy the perception of the ſucceſſion entirely.

* *Watſon's Treatiſe on Time.*

To us, therefore, it ſeems evident, that the conſtant and regular ſucceſſion of ideas in the mind of a waking man, is the meaſure and ſtandard of all other ſucceſſions; of which, if any one either exceeds the pace of which our ideas are capable, or falls ſhort of

it,

Of Time.

it, the ſenſe of a conſtant and continued ſucceſſion is loſt, and we perceive it not but with certain intervals of reſt between. So that it is not motion, but the conſtant train of ideas in our minds, that ſuggeſts to us our firſt notion of time; of which motion no otherwiſe gives us any conception, than as it cauſes in our minds a conſtant ſucceſſion of ſenſations: and we have as clear a notion of time by attending to the train of ideas ſucceeding each other in our minds, as by a train of ſenſations excited by conſtant and perceptible motion.

That it is merely by comparing the permanent exiſtence of things with the fleeting ſucceſſion of ideas in our own minds that we acquire our notions of time, may perhaps be ſtill more evident from the following narrative quoted by Dr Beattie *, from *L'Hiſtoire de l'Academie Royal des Sciences pour l'annee* 1719. "A nobleman of Lauſanne, as he was giving orders to a ſervant, ſuddenly loſt his ſpeech and all his ſenſes. Different remedies were tried without effect. At laſt, after ſome chirurgical operations, at the end of ſix months, during all which time he had appeared to be in a deep ſleep or deliquium, his ſpeech and ſenſes were ſuddenly reſtored. When he recovered, the ſervant to whom he had been giving orders when he was firſt ſeized with the diſtemper, happening to be in the room, he aſked whether he had executed his commiſſion, not being ſenſible, it ſeems, that any interval of time, except perhaps a very ſhort one, had elapſed during his illneſs." If this ſtory be true, here was a man, who, by the train of ideas vaniſhing at once from his mind, loſt the perception of what was to others ſix months of time; and had all mankind been in his ſtate, the ſame portion of time would have been irrecoverably loſt even to the annals of chronology.

* *Eſſay on Truth.*

We are aware of an objection to any inference which may be drawn reſpecting the preſent queſtion from the caſe of this nobleman. It may be ſaid, that he had loſt, together with the perception of time, the perception of every thing beſides; and that, therefore, motion may ſtill be the cauſe from which a waking man derives his notions of time. But in reply to this objection, we beg leave to aſk, Whether if a ball had been put in motion on a table, and the nobleman had been told, that a body moved with the velocity of that ball would have been carried over ſo many thouſand miles of diſtance during the time that he lay in a ſtate of inſenſibility, he could from ſuch information alone have formed any tolerable notion of the length of time in which he was inſenſible? He certainly could not, for want of a ſtandard by which to meaſure the rapidity of the motion. He would, indeed, have known inſtantly that he had been inſenſible for a conſiderable length of time, becauſe he had the evidence of former experience that a body carried by perceptible motion over a great extent of diſtance would have generated in his mind a vaſt train of ſucceſſive ſenſations; but till he had attended this ball during part of its courſe, and compared with the permanency of other objects the ſeries of ſenſations which it generated in his mind, he would not have been able to gueſs with any thing near to accuracy the length of time it would take to paſs over a thouſand miles.—The ſame inſenſibility of duration happens to every man in ſound ſleep. From having notions of time, ſuch as they are, formed in our minds, we never indeed ſuppoſe, however ſoundly we have ſlept, that the moment at which we awake in the morning is contiguous to that in which we fell aſleep at night. The reaſon is obvious; every man has been awake whilſt others were ſleeping, and has known by experience, that if they had been awake likewiſe a train of ideas would have paſſed through their minds which muſt have ſuggeſted to them the notions of time. Moſt men, too, have been frequently awake whole nights, and have thus acquired a notion of time as going on inceſſantly, whether perceived by them or not; and this notion being cloſely aſſociated with our ideas of night and morning, we inevitably ſuppoſe a portion of time to have elapſed between them, though unperceived by us in our ſleep. But were a man to ſleep without dreaming from Sunday night till Tueſday morning, and then to awake at his uſual hour as marked on the clock, there are numberleſs inſtances on record to convince us, that he would not of himſelf ſuppoſe, nor perhaps be very eaſily perſuaded, that more than one night had elapſed between his falling aſleep and the moment at which he awoke.

It being thus evident, that our notion of time is ſuggeſted by that compariſon which we inevitably make of the exiſtence of things permanent with the train of ideas inceſſantly paſſing through our minds; we may now perhaps be able to anſwer the queſtion, "What is time?" It muſt of neceſſity be one of three things, viz. either the ideal ſucceſſion itſelf; a certain quality inherent in all objects; or merely the relation of co-exiſtence between things that are permanent and the trains of fleeting ideas which ſucceed each other on the theatre of the imagination. It is not the firſt of theſe; for in every train of thought, the appearance of any one idea in the mind occupies no more of the extenſion of time, than a mathematical point occupies of the extenſion of diſtance. Ten thouſand mathematical points added together would make no part of a line; and ten thouſand ideas made to coaleſce, if that were poſſible, would occupy no part of that mode of duration which is called *time*. A point is the boundary of a line, but no part of it: the appearance of an idea in the mind is inſtantaneous; and an inſtant is the boundary, but no part of time. Hence it follows, that were every thing inſtantaneous like ideas in a train, there could be no ſuch thing as time, ſince nothing could be ſaid to have in that ſenſe of the word any duration. That time is not a quality inherent in all objects, is likewiſe plain; for we have ſeen, that were *ideas* as permanent as objects, the notion of time could never have been acquired. Succeſſion, though it does not itſelf conſtitute time, is eſſential to its exiſtence; and were all motion to ceaſe, and the attention of men to be immoveably fixed upon one invariable object or cluſter of objects, *time* would ceaſe likewiſe. It remains, therefore, that time can be nothing elſe than the relation of co-exiſtence apprehended between things that are permanent and thoſe trains of fleeting ideas which inceſſantly ſucceed each other on the theatre of the imagination. Thus whilſt a man is ſteadily looking at one object, which, from its being common, does not occupy his whole mind, he may be conſcious of a thouſand ideas ſtarting up in

21. Time mere relation of exiſtence.

Of Time. in his imagination, and each in its turn vanifhing the inftant in which it appeared. Every one of thefe ideas had an exiftence as well as the object at which he is looking; but the exiftence of each of them was inftantaneous and in fucceffion, whilft the exiftence of the external object is permanent. The object, therefore, as contrafted with the train of ideas, is faid to endure or to exift in time, whilft each idea is deftitute of duration, and exifts in no time.

Objections obviated. To this theory fome objections occur, which it will be incumbent upon us to obviate. It may be faid, that though each idea confidered by itfelf is inftantaneous, and occupies no time; yet the whole train when taken together, without being compared with any thing external, is perceived to occupy a confiderable portion of that mode of duration; and that, therefore, time itfelf muft be fomething more than a mere relation between a fleeting fucceffion of ideas and objects of more permanent exiftence. But how, we beg leave to afk, is the whole train perceived to occupy any portion of time? Is it not by being compared with our own exiftence? A man, whilft a train of ideas is paffing through his mind, may be fuddenly deprived of all his external fenfes, and then indeed it will be impoffible for him to compare the fleeting exiftence of this internal fucceffion with the more permanent exiftence of external things; but, whilft he thinks at all, he muft be confcious of his *own* exiftence, and cannot avoid perceiving, that whilft his ideas pafs in conftant fucceffion, each making an inftantaneous appearance in his mind, he himfelf remains unchanged. Now, what is it that this perception fuggefts to the mind? Evidently nothing more than the relation of co-exiftence between a fleeting fucceffion and a permanent object; for were it poffible that the man could be deprived of memory as well as of his fenfes, and ftill have ideas fucceeding each other in his mind, he would then think all objects equally fleeting; he would indeed be himfelf a mere fucceffion of inftantaneous diftinct perfons, and could have no notion whatever of time. His exiftence, though it fhould feem to endure half a century as eftimated by others, muft to himfelf appear to pafs away like a flafh of lightening.

It may be ftill further objected to our theory, that time is meafured by motion; and that it feems very abfurd to talk of meafuring a relation, efpecially a mere *ideal* relation, by a real external thing. In anfwer to this objection, which at firft fight appears formidable, we beg leave to obferve, that all relations are equally ideal; and that yet many of them may be faid to be meafured by real external things, with as much propriety as time can be faid to be meafured by motion. When a man wifhes to afcertain the relation of quantity which one body bears to another, though he knows that fuch a relation has no other than an ideal exiftence, and cannot be conceived but in conjunction with the related bodies, he applies to them fucceffively fome common ftandard; and having difcovered the relation which each bears to that, he compares the one relation with the other, and thus afcertains the relation fought. Juft fo it is with refpect to motion meafuring time. That which to each individual conftitutes real time, is the relation of co-exiftence between the fleeting fucceffion of his own ideas and other things of a more permanent nature. But a man has often occafion to afcertain the time of things external which fall not under the infpection of his fenfes; and in fociety all men have tranfactions with one another to be performed in fome determinate portion of time, though there are not, perhaps, two men exifting whofe ordinary trains of thought flow with precifely the fame rapidity. To remedy thefe inconveniences, it was neceffary to invent fome common ftandard, by means of which men might afcertain the duration of actions performed at a diftance, and be able to keep appointments made with each other. The only ftandard proper for thefe purpofes is fuch a conftant and equable motion as has fuggefted a flux of perceptions common to all men in all ages and countries; and hence the motions of the heavenly bodies have been univerfally made ufe of for the common regulators of time. Thefe motions, however, do not conftitute real and natural time, any more than a foot or a yard applied to two diftant bodies conftitutes the relation of quantity which thefe bodies bear to each other. They are merely ftated meafures, to be differently applied according to the different purpofes which we have in view.

Thus, if a man in Europe wifhes to know what would to him have been the *real* and *natural* time of an action performed in the Eaft Indies, he has only to be told, that it was co-exiftent, we fhall fuppofe, with a diurnal revolution of the earth; and by comparing this common meafure with his ufual flow of thought, he can form fome notion of the extent of that train of ideas, which, had he been prefent, would to him have been fucceffively co-exiftent with the action in queftion. But when perfons have an appointment to keep, this common meafure of motion muft be differently, or rather partially, applied. In fuch cafes, it is no part of their intention to compare their own exiftence with that of the whole train of ideas which may pafs in the mind of each; for the refult of fuch a comparifon, which alone conftitutes true and natural time, would not be the fame in perhaps any two men: but their purpofe is, to compare their own permanent exiftence only with that train of fenfations which fhall be excited in the mind by the perceptible motion of the fun, or any other body fixed upon which moves equably; and fuch a train muft confift of an equal number of inftants in all men. Neither the fun, nor the hour-hand of a common watch, moves with fuch apparent rapidity as to keep pace with the internal flow of thought of which the moft phlegmatic man is confcious. That thefe bodies move at all, is known only by their vifible change of place during the lapfe of a confiderable portion of real time; and as there is in their courfe a certain number of places diftinctly marked, to which alone it is agreed that the attention is to be turned, it is impoffible that of time fo computed two men can have different notions. Such time, however, is but partial; and the method of afcertaining it, when compared with that by which we afcertain real time, has a ftriking refemblance to that by which we afcertain the relation of partial quantity between two diftant bodies. When it is our purpofe to afcertain the relation of real quantity which one body bears to another, we apply the common ftandard to each in every dimenfion of length, breadth, Of Time.

breadth, and depth; but when we have no other view than to afcertain the relation of length which the one bears to the other, we apply the common ftandard to each in that dimenfion only. Juft fo it is with regard to real and partial time. When an individual wifhes to afcertain what would to him have been the duration of any action which he did not fee performed, he applies the common ftandard to the exiftence of that action, and to the ufual flow of his own thoughts; but when two men talk of the duration of any action, or agree to meet on fuch a day, they compare the exiftence of the action, or the diftance intervening between the prefent moment and the day of meeting, only with that partial train of fenfations which by the common ftandard is generated in an equal number, and in the fame order, in the minds of both.

215 Time muft have had a beginning.

It will be faid, that if time be nothing more than a mere relation fubfifting between trains of ideas or other fleeting objects, and things of a more permanent exiftence; and if the univerfe had a beginning; either time muft have had a beginning likewife, or the Deity cannot be immutable. We allow the force of the argument; but inftead of an objection, we confider it as a confirmation of the truth of our theory. The Deity, who is immutable, exifts not in time, but in eternity; and that thefe, though from the poverty of language they are both called modes of duration, are yet very different from each other, we fhall endeavour to prove in the next chapter.

Chap. VIII. *Of* Infinity *and* Eternity.

216 Why we treat of infinity and eternity among the adjuncts of body.

As corporeal fubftance is certainly not infinite, and as the prefent material fyftem has in itfelf every evidence of its not being eternal, it may feem ftrange, perhaps, to the reader, that we fhould treat of infinity and eternity among the adjuncts of body. But in modern metaphyfics thefe words are ufed in a vague fenfe to denote the extent of fpace and time; and in this chapter it is our intention to do little more than afcertain their meaning, and to fhow, in oppofition to fome celebrated names, of what fubjects they may not be predicated. There is a mathematical and a metaphyfical infinity, which, though often confounded, ought to be kept diftinct. In mathematics, extenfion is faid to be divifible *ad infinitum*, and number is fometimes confidered as infinite: but in metaphyfics thefe modes of expreffion are extremely improper. A pofitive and metaphyfical infinite is that which has no limits, and to which no addition can be made; but it is obvious that there is no number which may not be enlarged, nor any pofitive idea of extenfion which has not limits, and which may not be either increafed or diminifhed. The infinity of the mathematician is termed *infinity in power*, and that of the metaphyfician *abfolute infinity*. The firft confifts in this, that a being, however great or fmall it be fuppofed, may ftill be conceived to poffefs more greatnefs or minutenefs than we can form an idea of, even after the utmoft ftretch of human thought. Thus when it is faid that all extenfion as fuch is infinitely divifible, it is not meant that every extended fubftance contains an infinite number of *real parts*; for then the parts of an inch would be equal to thofe of a league: but the meaning is, that in ideal extenfion we can never reach the end of ideal divifion and fubdivifion. In like manner, when it is faid that number is infinite, the meaning is not that any pofitive number is without limits, or the poffibility of increafe, but that we might go on for ever; adding unit to unit, without approaching nearer to the end of the procefs. If, therefore, the mathematician would fpeak properly, and without the affectation of paradox, he ought to fay that all extenfion as fuch is *indefinitely* divifible, and that unit might be added to unit without end; but thefe phrafes fuggeft notions very different from that of a metaphyfical infinite, which is fomething pofitive to which nothing can be added. (B)

Of Infinity and eternity.

21[7] Space and time held to be the one infinite, the other eternal.

That there is fomething pofitively infinite, has been very feldom queftioned; but it has been warmly difputed among metaphyficians what fubjects are infinite. Dr Clarke and his adherents have contended that fpace and time are real things; that they are both of neceffary exiftence; that the former impreffes us with the idea of its infinity, and that the latter is pofitively eternal. "Time and fpace (fays the Doctor*) are the *fine qua non* of all other *things*, and of all other *ideas*. To fuppofe either of them *finite*, is an exprefs *contradiction* in the idea itfelf. No man *does* or *can* poffibly *imagine* either of them to be finite; but only either by *non-attention* or by *choice* he attends perhaps to *part* of his *idea*, and *forbears attending to* the remainder. They who fuppofe *fpace* to be nothing but a *relation between two bodies* are guilty of the abfurdity of fuppofing that which is *nothing* to have *real qualities*: *For the fpace which is between two bodies* is always unalterably juft what it was, and has the very fame dimenfions, quantity, and figure, whether *thefe* or any *other bodies* be there or any where elfe, or not at *all*. Juft as *time* or *duration* is the fame, whether you turn your *hour-glafs* or no, or whether the fun moves or ftands ftill, or whether there *was* or *was not any fun*, or any *material world* at all. To fet *bounds* to fpace is to fuppofe it *bounded* by fomething which itfelf *takes up fpace*, and that's a *contradiction*; or elfe that it is *bounded by nothing*, which is another contradiction. To fuppofe fpace *removed*, *deftroyed*, or *taken away*, amounts to the abfurd fuppofition of removing a thing away *from itfelf*; that is, if in your *imagination* you *annihilate* the *whole* of *infinite fpace*, the whole of *infinite fpace* will ftill remain; and if you annihilate any *part* of it, *that part* will ftill *neceffarily* remain, as appears by the unmoved fituation of the *reft*; and to fuppofe it *divided* or *divifible* amounts to the fame contradiction."

* *Demonftration of the Being and Attributes of God, a Correfpondence with a Gentleman of Gloucefterfhire.*

The abfurdity of confidering fpace as a real external thing has been already evinced in chap. 4th, p. 549, where it was fhown how we acquire the notion, and what kind of notion it is. Space, as was there obferved, may be conceived either as the mere abfence and poffibility of body; or as ideal extenfion, united to, and inhering in, an ideal fubftratum. Taken in the former fenfe, it is an object of pure intellect; in the latter, it is

(B) Ου γαρ ου μηδεν εξω αλλ' ου αει τι εξω εστι, τουτο απειρον εστι. *Arift. Phyf. Aufcult. Lib. 9. cap. 9. page 492, Tom. I. Oper.*

ity is an *idea* or *form* in the imagination. That the abſence of body or matter is the *ſine qua non* of all other things, and all other ideas, Dr Clarke was not diſpoſed to affirm, when he made the divine ſubſtance, to pervade every material atom in the univerſe: and to talk of the abſence of body being infinite is a palpable contradiction, unleſs Berkeley's doctrine be true, that the material world has no exiſtence. To ſay that the *poſſibility* of matter is infinite, is to uſe language which has no other meaning than that, however far the material world be on all ſides extended, its extenſion may ſtill be conceived greater and greater *ad infinitum*. This is a poſition which no philoſopher ancient or modern has ever denied; but it is ſo far from implying that we have a poſitive idea of the infinity of the material world, or of any adjunct of the material world, that it is abſolutely inconſiſtent with ſuch infinity. Whatever is capable of perpetual increaſe muſt certainly have limits, and every new addition is the limit of that to which the addition was made.

Taken in the ſecond acceptation as an ideal extenſion united with an ideal *ſubſtratum*, ſpace is ſo far from being infinite in any ſenſe of the word, that we will venture to aſſert no man ever contemplated ſuch a *form* in his own imagination, without conceiving it to be bounded. Of this, at leaſt, we are certain, that when we have attempted to frame a poſitive idea of pure ſpace, it has not been in our power to diveſt that idea of limits. Thoſe who can frame in their minds real and poſitive ideas wholly abſtracted from every individual object, may indeed perform in this way many feats above our abilities; but as we poſſeſs no ſuch powers of abſtraction, every thing which we can call an idea is limited in the ſame manner that the object itſelf is limited from which the idea was derived.—Thus, the largeſt expanſion that ever we beheld is the concave hemiſphere; and when we try to form the largeſt poſitive idea of pure ſpace, all that we can do is to figure to ourſelves that concave empty of body. We may, indeed, ſuppoſe its diameter to be either a million or ten thouſand millions of miles; and we may go on enlarging it *ad infinitum*: but when we return from this proceſs of intellect to the contemplation of the ideal forms in the imagination, none of theſe forms appear to us larger or more extended than the hemiſphere, which is the object of ſenſe, and they all appear to be bounded, and bounded in the very ſame way.

With reſpect to the eternity of time, we think Dr Clarke equally miſtaken as with reſpect to the infinity of ſpace. Of time, indeed, we cannot properly ſpeaking have any *idea* or mental *form*. Time, as we have ſeen, is a mere relation, and is in itſelf the creature of the mind which has no external *ideatum*. It is ſuggeſted, however, by the fleeting ſucceſſion of our ideas, compared with the more permanent exiſtence of other objects; and therefore ſucceſſion is eſſential to it. But nothing which has parts, whether co-exiſtent or in ſucceſſion, can be poſitively infinite. For, "in an infinite ſeries of ſucceſſive generations of men, for inſtance, there will be ſeveral infinites that are parts of one another, and by conſequence one greater than another: which (as has been well argued *) is an expreſs contradiction, ſince the greater muſt neceſſarily bound the leſs, and exceed its limits by ſo much as it is greater than it; that is, muſt make it not infinite. Infinite generations contain an infinitely greater infinity of particular men. An infinite number of men muſt have twice as many hands, and ten times as many fingers, and ſo on. Infinite time has an infinity of ages; theſe a much greater infinity of years, days, hours, &c. Space likewiſe (according to Dr Clarke) has three dimenſions, all infinite. It muſt, therefore, contain an infinity of ſurfaces, an infinitely greater infinity of lines, and a ſtill infinitely greater infinity of phyſical points. The caſe is the ſame in number itſelf, which, if we ſuppoſe it to contain an abſolute infinity of thouſands (and we may as well do that as imagine it to comprehend an infinity of units), it will contain ten times as many hundreds, fifty times as many ſcores, and ſo on. All this is only the *indefiniteneſs* of number, which we in vain attempt to turn into a poſitive infinite with which it is totally incompatible. For let us add *one* to any of theſe infinite ſeries of generations, ages, lines, or numbers, which we know to be always in our power, and if it was abſolutely infinite before, here is one more than infinite. If it only becomes infinite now, then one finite added to another finite makes infinity. If it be no larger after the addition than it was before, then one part added to another adds nothing; all which are abſurdities. The ſame will appear, if we ſubtract a part from this ſuppoſed abſolute infinite, which may be done in any of the formentioned ſubjects, as well as in every thing which admits of parts, or may be taken in pieces by the mind."

Of Infinity and Eternity.

221 The uſual reply to the foregoing reaſoning ſhown

To this kind of reaſoning Dr Clarke replies as follows: "To endeavour to prove that there cannot poſſibly be any ſuch thing as *infinite time* or *ſpace*, from the impoſſibility of an addition of finite parts ever compoſing or exhauſting an infinite; or from the imaginary inequality of the number of years, days, and hours, that would be contained in the one; or of the miles, yards, and feet, that would be contained in the other, is ſuppoſing infinites to be made up of numbers of finites; that is, it is ſuppoſing finite quantities to be *aliquot* or *conſtituent parts* of infinite, when indeed they are not ſo, but do all *equally*, whether *great* or *ſmall*, whether *many* or *few*, bear the very ſame proportion to an infinite, as mathematical points do to a line, or lines to a ſuperficies, or as moments do to time, that is, none at all. No given number or quantity can be any *aliquot* or *conſtituent* part of infinite, or be compared at all with it, or bear any kind of proportion to it, or be the foundation of any argument in any queſtion concerning it."

If it be indeed true, and it is that for which we contend, that no given number or quantity can be any aliquot or conſtituent part of infinite, or be compared at all with it; then it undeniably follows, not that miles, yards, and feet, are no conſtituent parts of ſpace; or years, days, and hours, conſtituent parts of time; but that ſpace and time cannot poſſibly be poſitive infinites. This, we ſay, follows undeniably: for nothing is more evident, than that all quantities of the ſame kind, from the largeſt to the leaſt, bear a certain proportion to each other; and upon the ſuppoſition that ſpace is a real extended thing, miles, yards, and feet are included in it, and bear to it the relation of parts to a whole. The ſame is true of time, days, and hours. To aſſum (for no proof is offered), that all

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all finite quantities, whether great or small, whether many or few, do equally bear the very same proportion to an infinite, as mathematical points do to a line, or as moments do to time, is plainly to beg the question—"that *space* considered as a real extended thing is *infinite*;" and to beg it, too, in opposition to the common sense and reason of mankind. Mathematical points we all know to be nothing real, but merely negations of extension; but supposing space to be something real and extended, can any man persuade himself that a mile or a million of miles of this space is likewise a mere negation of extension? With him who can bring himself to this persuasion, we pretend not to argue. He is possessed of faculties, whether true or false, of which we are destitute.

222 to be a *petitio principii.*

That finite quantities, whether great or small, do all equally bear the same proportion to an *infinite in power*, is indeed true; but it is no great discovery: for such an infinite, as we have seen, is nothing but the continued possibility of repeating the same mental process of addition or multiplication; and he who can go on for ever adding, in his own imagination, foot to foot, or hour to hour, will find it equally easy to add, in the same manner, league to league, or age to age. If he can perform the one operation, he must likewise have power to perform the other; and he cannot but perceive that it is as impossible to come to an end of adding league to league, or age to age, as of adding foot to foot, or hour to hour; but then he must know that these leagues, feet, ages, and hours, are not real external things, but mere ideas and notions in his mind. If such powers of ideal multiplication and addition be what Dr Clarke means by the ideas of space and time, it is indeed a contradiction to suppose either of them limited; for that is to suppose our powers different from what we know them to be by consciousness and experience. But to confound *powers* with the *objects* of those powers, is certainly very inacurate; and to suppose, because we can go on for ever adding one portion of ideal space or time to another, that therefore our ideas of space and time are in themselves positively infinite, is a contradiction: for to an idea positively infinite, it is obvious that nothing can be added. Either, therefore, space and time do not impress us with the ideas of their positive infinity; or we cannot have the power of adding league to league, and age to age, without end.

"But (says the Doctor), to suppose space removed, destroyed, or taken wholly away, amounts to the absurd supposition of removing a thing from itself; that is, if in your imagination you remove the whole of space, the whole of space will still remain." True, every man has ideas of space treasured up in his imagination, which the sound of the very word space will at all times bring into his immediate view; and whilst he has such ideas, it is impossible that he should not have them; which is all the mystery of the matter, and amounts to nothing more than that a thing cannot be and not be at the same instant. When the Doctor affirms, that if "you annihilate any part of space, that part will necessarily remain, as appears by the unmoved situation of the rest", we are not certain that we perfectly understand him. A man may surely think of a cubical inch without thinking of a foot or a yard; and he may suppose the inch taken away from the foot or the yard, and these ideal quantities so much lessened by the subtraction. But if the Doctor be here again confounding the powers of the mind with the positive ideas of space, the sentence when explained will be seen to contain nothing to his purpose. Every man has the power of contemplating in idea millions of miles, and millions of ages, and of adding mile to mile, and age to age, without end; and if he try to deprive himself of any part of this power, or to fix a limit to the mental process of addition, he will find that in spite of himself his imagination will ramble beyond the limit assigned, and that he has attempted an impossibility. This, however, is so far from being a proof that his ideas of space and time are positively infinite, that, as we have already observed, it is a proof of the contrary.

But (say this great man and his followers) "space and time are the *sine qua non* of all other things and all other ideas. The supposal of the existence of *any thing whatever* includes necessarily a *presupposition* of the existence of *space* and *time*;" and therefore, if there be any thing infinite and eternal, space and time must likewise be so.

Space and time said to be the *sine qua non* of other things

To every corporeal substance, and every idea of such substance, space and time are indeed necessary: for every body has extension and duration; and every idea of a particular body, being nothing but a secondary perception in the imagination or memory, must have the same relation to imaginary extension, that the object from which it was derived has to extension which is real. Every idea, too, which remains in the imagination whilst a train of other ideas passes successively in view, or whilst external things are perceived to change, has real time. But will any man say that *consciousness*, our notion of *power*, our acts of *willing*, or even *tastes*, *sounds*, and *smells*, are extended, or that the supposal of their existence necessarily implies a presupposition of the existence of space? We acquire our ideas of extension and space by means of our senses of touch and sight; and we learn from experience, that things external and extended are the causes of our sensations of taste, sound, and smell. The effects are in our minds closely associated with the ideas of their causes; and it is not perhaps easy to think of a particular sound, taste, or smell, without at the same time thinking of the object by which it was at first excited in the mind: but had we been originally formed with the powers of consciousness, thinking, and willing, and with no other senses than those of tasting, smelling, and hearing, it is obvious that we never could have had the idea of *space*; and therefore, that idea cannot possibly be necessary to the presupposition of every thing else. To consciousness, thinking, and willing, space is so far from being necessary, that we cannot perceive any the most distant relation between them. It is not more difficult to conceive a part greater than the whole, than it is to conceive an ell of *consciousness*, of *thought*, or of *will*; nor is it in the power of any man to make *space* and *sweetness* coalesce in his mind so as to form of the two simple ideas one complex conception. The very reverse is the case with respect to the objects of sight and touch. The idea of every thing which we see and handle necessarily

there are things which no ... space.

ly coaleſces in the mind with the idea of ſpace, nor can we poſſibly ſeparate the one from the other; but the things which we ſee and handle are neither infinite nor capable of infinity.

With reſpect to time, the ſame obſervations will be found to be juſt as with reſpect to ſpace. Whatever is liable to change, exiſts in time and cannot be eternal; but if there be any being immutable, and who views at once all things which to us are paſt, preſent, and to come, the exiſtence of that being is not commenſurable with time. That ſuch a being is poſſible no man can doubt, who reflects, that if we had one permanent idea invariably in the mind, we ſhould never have acquired the *notion* of ſucceſſion or of time; and that if there were *actually* no *change* in nature there could not poſſibly in nature be any ſuch *thing as time*. Every man, therefore, who can conceive exiſtence without change, muſt be convinced, that "the ſuppoſal of the exiſtence of any thing whatever does *not* neceſſarily include the preſuppoſition of the exiſtence of time; and that there may be an eternity diſtinct from time, as well as an infinity diſtinct from ſpace; nay that nothing which is properly infinite and eternal can poſſibly occupy either ſpace or time.

If it be aſked, what kind of infinity and eternity they are which have no relation to ſpace and time? Cudworth, treading in the footſteps of the ancients, has long ago anſwered, that they are "abſolute perfection, and neceſſary exiſtence. For (ſays he), *infinite underſtanding* and *knowledge* is nothing elſe but *perfect* knowledge, which hath in it no defect or mixture of ignorance, but knows whatſoever is knowable. In like manner, *infinite power* is nothing elſe but *perfect* power, which hath in it no defect or mixture of impotency—a power which can do every thing which is poſſible or conceivable. Laſtly, *infinity of duration*, or *eternity*, is really nothing elſe but *perfection*, as including in it *neceſſary exiſtence* and *immutability*; ſo that it is a contradiction to ſuppoſe ſuch a being to have had a beginning, to ceaſe to be, or to ſuffer or be affected by any change whatever. And becauſe infinity is perfection, therefore nothing which includes in its idea or eſſence any thing of *imperfection*, as every poſitive idea of number, corporeal magnitude, and ſucceſſive duration evidently does, can be truly and properly infinite." *

Infinity and Eternity.

It muſt indeed be confeſſed, that the idea of ſucceſſion ſo inſinuates itſelf into our uſual ideas of exiſtence, and is ſo cloſely connected with the exiſtence of all finite beings, that we find it extremely difficult to imagine the eternal exiſtence of God, any otherwiſe than as an eternally continued ſeries or ſucceſſion. Our conſtant converſation with material objects, and the aſſociations thence ariſing, make it almoſt impoſſible for us to conſider things abſtracted from time and ſpace; yet we have the evidence of experience and conſciouſneſs, that an idea may be conceived without relation to ſpace and time, and that ſpace and time cannot be made to coaleſce with ſome of our notions. The ſame muſt be true with reſpect to infinity and eternity; for we have ſeen that neither ſpace, time, nor any thing elſe which conſiſts of parts, whether continuous or ſucceſſive, can be ſuppoſed to be poſitively infinite, as the ſuppoſition implies the moſt palpable contradiction. But that there may be perfect power, perfect knowledge, and permanent invariable exiſtence, is ſo far from implying any contradiction, that even we, whoſe faculties are ſo very narrow, can yet make ſome advances towards the conception of ſuch perfections. Thus, every man of common underſtanding knows that ſome things are in themſelves poſſible, and others impoſſible, to be performed by any power. Of theſe poſſibilities and impoſſibilities a philoſopher knows more than an illiterate man; and one philoſopher knows more than another. An intellect more perfect knows more of them than any man; and that intellect which knows them all muſt be abſolutely perfect, and incapable of improvement, becauſe it knows every thing which is to be known. The ſame is true of perfect power:—but we ſhall treat of real infinity and eternity more at large when we come to demonſtrate the being and attributes of God. At preſent it is ſufficient to have ſhown, that nothing can be poſitively infinite but a being abſolutely perfect; which never was not, which can produce all things poſſible and conceivable, and upon which all other things muſt depend.

* Intellectual Syſtem.

PART III. OF MINDS AND THEIR POWERS.

CHAP. I. *Of* MIND *in* GENERAL.

THE ſcience of metaphyſics comprehends every thing into the exiſtence, nature, or cauſes, of which any inquiry may be made. But all things of which we have any notion or idea may be divided into mind and body, with their various powers, qualities, and adjuncts. By body is meant that which is ſolid, extended, inert, and diviſible; and its ſeveral adjuncts are ſpace, motion, number, and time. The only mind with which we are *intimately* acquainted is our own; and we know that it is poſſeſſed of the powers of ſenſation, perception, retention, conſciouſneſs, reflection, reaſon, and will. Theſe are totally different from extenſion, ſolidity, diviſibility, and motion; and therefore it is proper to diſtinguiſh the being of which they are powers by another name than that of body.

228 Probably minds of different orders.

Of bodies there are various kinds poſſeſſing various ſenſible qualities; and from analogy it is reaſonable to conclude, that there may be various claſſes of minds endowed with different kinds or degrees of power. For this indeed we have ſtronger evidence than that of analogy. Brute animals evidently poſſeſs the powers of perception and ſpontaneity with ſome degree of conſciouſneſs; but as they appear not to reflect upon their own conduct, or to have their actions influenced by motives, their minds are inferior to ours, though ſtill perfectly diſtinct from mere extended, inert, and diviſible ſubſtances. Mind, therefore, conſidered with reſpect to its powers, is evidently different from body conſidered with reſpect to its qualities. This is indeed

Of Mind in general.

a truth which has ſeldom if ever been controverted; but it has been long and warmly diſputed, Whether mind and body be not both compoſed of the ſame firſt matter?

229 The abſurd hypotheſis of Hobbes reſpecting mind.

Hobbes ſuppoſed, that every material atom is endowed with the faculty of ſenſation (c); but that for want of memory each ſenſation is momentaneous, being inſtantly and wholly effaced as ſoon as its cauſe is removed. Though this hypotheſis is too abſurd to require a formal and laboured confutation, it may not be improper to obſerve, that, if it were true, the hairs of a man's head would feel extreme pain when pinched by the hot iron of the hair-dreſſer; and that the nails of his fingers would be ſeverely tortured when under the operation of the knife or the raſp.

230 Other abſurd hypotheſes.

Others have ſuppoſed that each atom of matter has a *tendency towards* ſenſation and perception; and that when a ſufficient number of theſe atoms are brought together in a certain order, the *united tendencies* produce the *actual* powers which diſtinguiſh mind from groſs body. This ſuppoſition is if poſſible more abſurd than that of Hobbes. Senſation and perception are of ſuch a nature, that a mere *tendency towards* them is inconceivable. A thing muſt either be ſenſible and percipient, or inſenſible and inert: there is evidently no medium. Or if we could ſuppoſe each individual atom to have a *tendency* towards ſenſation, it would by no means follow that a number of ſuch atoms brought together in any poſſible order would become one ſentient, thinking, and active being. A number of bodies laid upon an inclined plain have each a *tendency* to roll downwards; but if the declivity of the plain be not ſuch as that their ſeparate tendencies may overcome the reſiſtance oppoſed to each individual body by friction, the *united tendencies* of all the bodies when brought together will not be able to overpower the reſiſtance of their united frictions. Juſt ſo is it with reſpect to ſenſation and perception: If the tendency of one atom cannot overcome one degree of inertneſs, the tendency of a thouſand atoms will not overcome a thouſand degrees of the ſame inertneſs.

231 Only two opinions at preſent on the ſubject.

We have juſt mentioned theſe abſurd ſuppoſitions that our article might be complete: but it is proper to inform the reader, that, ſo far as we know, neither of them has for theſe many years been maintained by any philoſopher of eminence either at home or abroad. The opinions on this ſubject, which at preſent divide the republic of letters, are two; and theſe alone are worthy of examination. One party maintains, That perception, memory, reaſon, and will, &c. are the powers of a being which muſt be immaterial and indiviſible: The other alleges, That as we know nothing of theſe powers but from our own conſciouſneſs, and as we can trace them in ourſelves to the brain and no farther, we have no reaſon to ſuppoſe that they are the powers of any ſubſtance diſtinct from matter. Both parties, however, diſtinguiſh that which in man is the ſubject of thought from his external organs of ſenſe, and agree to call it by the name of *mind*; though the one conſiders it as compoſed of the ſame firſt matter with the duſt of the ground; whilſt the other believes it to have no property whatever in common with that matter.

Were we to adopt ſome of the ancient methods of philoſophiſing, this important queſtion might be ſoon decided. A moſt reſpectable writer, who has laboured to reſtore the metaphyſics of Plato and Ariſtotle, hopes to confute the materialiſts, by laying down what they muſt think arbitrary definitions of mind and matter, and then ſhowing that the one is not the other. "In all the parts of the material world (ſays he) there is a perpetual *motion*: For the celeſtial bodies move conſtantly in one reſpect or another; and all here below is in a continual viciſſitude of generation and corruption, which cannot be without *motion*. Now, where there is *motion*, there muſt be ſomething that *moves*: What is *moved* I call *body*; what moves I call *mind*." From this definition he undertakes to prove, that mind muſt be immaterial. "That there is a relation between *moving* and *being moved* (ſays he), nobody can deny; and the relation is no other than that of *action* and *paſſion*. But the nature of relation is ſuch, that it muſt neceſſarily be between two things at leaſt; and it is further neceſſary, that the two things related ſhould exiſt together. Hence, if there be that which *moves*, there muſt be a different thing that *is moved*; and wherever the one is, the other muſt neceſſarily be; ſo that nothing can move itſelf. This being eſtabliſhed, I ſay that what *moves* muſt be either material or immaterial: for the one of theſe being the negation of the other, there can be no middle betwixt them; becauſe a thing muſt neceſſarily *be*, or not *be*. If then it be immaterial, there is an end of the queſtion: but if it be ſaid to be material, then I ſay that it muſt be *moved* itſelf before it can move any thing elſe; for it is only in that way that body can move body. If then it muſt be firſt moved itſelf, but cannot itſelf move itſelf, what is it that moves it? If it be anſwered, That it is another material mover, then I repeat the ſame queſtion, to which the ſame anſwer muſt be given: and ſo we have an infinite ſeries of *material movers*, without any beginning or *principle* of *motion*. Now this is abſurd, and contradictory to this firſt principle of natural philoſophy, admitted by all philoſophers ancient and modern, That *nothing can be produced without a cauſe* ‡."

‡ Anci. Metaſ. ...

For the immateriality of the human mind, and of every being endowed with the powers of perception and thought, the learned writer has better arguments; but it is upon this chiefly that he reſts his perſuaſion, that mind is the only *mover* in the univerſe. It is needleſs to obſerve, that in the very definitions and axioms upon which this reaſoning is built, the thing to be proved is taken for granted: for if it be ſelf-evident,

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(c) Scio fuiſſe philoſophos quoſdam, eoſdemque *viros doctos*, qui corpora omnia ſenſu prædita eſſe ſuſtinuerunt: *Nec video*, ſi natura ſenſionis in reactione ſola collocaretur, QUOMODO *refutari poſſint*. Sed etſi ex reactione etiam corporum aliorum, phantaſma aliquod naſceretur; illud tamen, remoto objecto, ſtatim ceſſaret. Nam niſi ad retinendum motum impreſſum, etiam remoto objecto, apta habeant organa, ut habent animalia; ita tantum ſentient, ut nunquam ſenſiſſe ſe recordentur. Senſioni ergo, quæ vulgo ita appellatur, neceſſario adhæret memoria aliqua. *Hobbes's Phyſic*, cap. 25. ſect. 5.

dent, that what *moves* is, in the author's ſenſe of the word, *mind*, that what is *moved* is *body*, and that *nothing can move itſelf*, all reaſoning on the ſubject is ſuperfluous. This, however, is ſo far from being ſelf-evident, that a materialiſt may reply, "every animal moves itſelf, and yet every animal is nothing more than a ſyſtem of matter." This poſition, whether true or falſe, can neither be proved nor confuted by arguments *à priori* founded on general definitions. That animals move themſelves, and that to the ſenſes they appear to be nothing elſe than ſyſtems of matter, are facts which cannot be controverted. If we would know whether they have in them a principle of motion which is not material, we muſt ſubmit to the laws of induction (ſee Logic); and by inveſtigating the eſſential qualities of matter, endeavour to aſcertain whether a material ſyſtem can be rendered active. That we ourſelves have active powers, we know by the moſt complete of all evidence, *viz.* conſciouſneſs of their energies; and it has been already ſhown, that ſuch powers as we experience in ourſelves cannot exiſt but in a ſubject poſſeſſed of will and underſtanding. The queſtion therefore to be firſt decided between the materialiſts and immaterialiſts is, Whether the powers of conſciouſneſs, underſtanding, and will, can reſult from the particular organiſation of a ſyſtem of matter? If they can, we have no reaſon to attribute them in man to any other ſource: If theſe powers appear neceſſarily to require an immaterial principle for their ſupport, it will probably be granted, that an immaterial principle is the ſource of every power and every motion in the univerſe; and the doctrine of *mind*, in the ſtricteſt ſenſe of the word, will be ſufficiently eſtabliſhed.

Chap. II. *Of the* Substance *of the* Human Mind.

The moſt celebrated materialiſt of this or perhaps of any other age is Dr Prieſtley; who having in his own imagination diveſted matter of ſolidity, and reduced it to mere centres of attraction and repulſion, obſerves, that "if one *kind of ſubſtance* be capable of ſupporting all the known *properties* of man; that is, if thoſe properties have nothing in them that is abſolutely incompatible with one another; we ſhall be obliged to conclude (unleſs we openly violate the rules of philoſophiſing, which will not authoriſe us to *multiply cauſes* or kinds of ſubſtance *without neceſſity*), that no other kind of ſubſtance enters into his compoſition; the ſuppoſition being manifeſtly *unneceſſary*, in order to account for any appearance whatever.—All the properties that have hitherto been attributed to matter, may be compriſed under thoſe of attraction and repulſion. Beſides theſe, man is poſſeſſed of the powers of *ſenſation* or *perception*, and *thought*. But if, without giving the reins to our imaginations, we ſuffer ourſelves to be guided in our inquiries by the ſimple rules of philoſophiſing above mentioned, we muſt neceſſarily conclude, that theſe powers alſo may belong to the ſame ſubſtance that has alſo the properties of attraction, repulſion, and *extenſion* (D), which I as well as others call by the name of *matter*. The reaſon of the concluſion is ſimply this, that the powers of ſenſation or perception and thought, as belonging to man, have never been found but in conjunction with a certain *organiſed ſyſtem of matter*; and therefore that thoſe powers neceſſarily exiſt in and depend upon ſuch a ſyſtem. This at leaſt muſt be our concluſion, till it can be ſhown that theſe powers are incompatible with the other known properties of the ſame ſubſtance; and for this I ſee no ſort of pretence."

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This is what Dr Prieſtley calls the proper and direct proof that the ſentient principle in man is the material ſubſtance of the brain; and he enforces it by the following obſervations: "Had we formed a judgment concerning the neceſſary ſeat of thought by the circumſtances that *univerſally accompany it*, which is our rule in all other caſes, we could not but have concluded that in man it is a property of the *nervous ſyſtem*, or rather of the brain; becauſe, as far as we can judge, the faculty of thinking, and a certain ſtate of the brain, always accompany and correſpond to one another; which is the very reaſon why we believe that any property is inherent in any ſubſtance whatever. There is no inſtance of any man retaining the faculty of thinking when his brain was deſtroyed; and whenever that faculty is impeded or injured, there is ſufficient reaſon to believe that the brain is diſordered in proportion; and therefore we are neceſſarily led to conſider the latter as the ſeat of the former. Moreover, as the faculty of thinking in general ripens and comes to maturity with the body, it is alſo obſerved to decay with it; and if, in ſome caſes, the mental faculties continue vigorous when the body in general is enfeebled, it is evidently becauſe in thoſe particular caſes the *brain* is not much affected by the general cauſe of weakneſs. But, on the other hand, if the brain alone be affected, as by a blow on the head, by actual preſſure within the ſkull, by ſleep, or by inflammation, the mental faculties are univerſally affected in proportion. Likewiſe, as the mind is affected in conſequence of the affections of the body and brain, ſo the body is liable to be reciprocally affected by the affections of the mind, as is evident in the viſible effects of all ſtrong paſſions, hope or fear, love or anger, joy or ſorrow, exultation or deſpair. Theſe are certainly irrefragable arguments, that it is properly no other *than one and the ſame thing* that is ſubject to theſe affections, and that they are neceſſarily dependent upon one another. In fact, there is juſt the ſame reaſon to conclude, that the powers of ſenſation and thought are the neceſſary reſult of a particular organization, as that ſound is the neceſſary reſult of a particular concuſſion of the air. For in both caſes equally the one conſtantly accompanies the other; and there is not in nature a ſtronger

(D) When Dr Prieſtley mentions the *extenſion* of corporeal ſubſtance, it muſt be remembered that he does not mean the extenſion of any real thing poſſeſſed of an independent exiſtence. The extenſion belongs wholly to the *ſphere* or the *combination* of ſpheres of *attraction* and *repulſion*. The centre itſelf, which attracts and repels, he repeatedly affirms not to have the dimenſions even of a phyſical point; and he ſometimes ſeems to entertain a doubt whether it be any thing more than a mere relative notion.

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stronger argument for a necessary connection or any cause and any effect. To adopt an opinion different from this, is to form an hypothesis without a single fact to support it." *.

Though the ingenious author thinks, that if there be any foundation for the established rules of philosophising, this reasoning ought to be conclusive, he yet subjoins, for the greater satisfaction of his readers, some additional arguments, or rather, as he says, distinct illustrations of the great argument. They are as follows:

1 "That the faculty of thinking necessarily depends, for its *exercise* at least, upon a stock of ideas, about which it is always conversant, will hardly be questioned by any person. But there is not a single idea of which the mind is possessed but what may be proved to have come to it from the bodily senses, or to have been consequent upon the perceptions of sense. The notion, therefore, of the *possibility* of thinking in man, without an organized body, is not only destitute of all evidence from actual appearances, but is directly contrary to them; and yet these appearances ought alone to guide the judgment of philosophers.

2. "The only reason why it has been so earnestly contended for, that there is some principle in man that is not material, is, that it might subsist, and be capable of sensation and action, when the body is dead. But if the mind was naturally so independent of the body, as to be capable of subsisting by itself, and even of appearing to more advantage, after the death of the body; it might be expected to discover some signs of its independence before death, and especially when the organs of the body were obstructed, so as to leave the soul more at liberty to exert itself; as in a state of *sleep* or *swooning*, which must resemble the state of death; in which it is pretended that the soul is most of all alive, most active, and vigorous. But judging by appearances, the reverse of all this is the case.

3. "If the mental principle was, in its own nature, immaterial and immortal, all its particular faculties would be so too; whereas we see that every faculty of the mind without exception is liable to be impaired, and even to become wholly extinct, before death. Since, therefore, all the faculties of the mind, separately taken, appear to be mortal, the substance or principle in which they exist must be pronounced to be mortal too.

4. "If the sentient principle in man be immaterial, it can have no *extension*; it can neither have length, breadth, nor thickness; and consequently every thing within it, or properly belonging to it, must be *simple* and *indivisible*. Let us now consider how this notion agrees with the phenomena of sensation and ideas. It will not be denied, but that sensations or ideas properly exist *in the soul*, because it could not otherwise retain them, so as to continue to perceive and think after its separation from the body. Now, whatever ideas are in themselves, they are evidently produced by external objects, and must therefore correspond to them; and since many of the objects or archetypes of ideas are divisible, it necessarily follows, that the ideas themselves are divisible also. But, how is it possible that a thing (be the nature of it what it may) that is *divisible*, should be contained in a substance, be the nature of *it* likewise what it may, that is *indivisible*? If the archetypes of ideas have extension, the ideas which are expressive of them, and are actually produced by them according to certain mechanical laws, must have extension likewise; and therefore the mind in which they exist, whether it be material or immaterial, must have extension also. But how any thing can have extension and yet be immaterial, without coinciding with our idea of mere empty *space*, I know not."

* *Disquisitions on Matter and Spirit.*

To the argument, which is here chiefly insisted on as being agreeable to the established rules of philosophising, a very able reply has been made, which we shall give in the words of its elegant and spirited author. But before we attempt to dig up the foundation of the Doctor's system, it may not be improper to demolish, if possible, the additional buttresses by which it is strengthened. An experienced general, before he storm a citadel which he knows to be strongly fortified and skilfully defended, will take care to raze every less important redoubt from which the enemy might annoy him in his rear.

Answ 23

Because the faculty of thinking in general ripens, comes to maturity, and decays with the body, and the body on the other hand is affected by the affections of the mind, the Doctor affirms that we have the same reason to conclude, that the powers of sensation and thought are the necessary result of a particular organisation, as that sound is the necessary result of a particular concussion of the air. This argument is conclusive only upon the supposition that there is no *positive* evidence whatever for the immateriality of the being which is the subject of thought. If the other reasonings for the materiality and immateriality of the mind be of equal weight, this argument ought doubtless to turn the balance; but if there be the smallest preponderancy in behalf of the immaterialists, it is a mere begging of the question to attempt to counteract it by any inference which can be drawn from the mutual affections of the body and mind. If two such heterogeneous beings as an immaterial mind and an organised body can be supposed united in one person, they must necessarily affect each other; and to affirm, on account of this reciprocal affection, that they are *one and the same*, is equally absurd as to say that an electrician and his apparatus are *one and the same*. Dr Priestley himself did not at first perform his electrical experiments with so much ease as after he had acquired facility by long practice, nor could he even yet perform them so neatly with a bad as with a good apparatus.

That which the Doctor calls the first illustration of his argument might be admitted, and the force of the argument itself be consistently denied. Some kind of organised body may be necessary to the mind as an instrument without which it could not exert its faculties; but it would certainly be rash to infer that the mind must *therefore* be a system of matter. An anvil and a hammer are necessary to the exercise of the blacksmith's art; but what would be thought of him who should from this fact conclude, that the blacksmith himself must be a system of iron? This, therefore, instead of illustrating the great argument, seems to be wholly foreign from the question in debate; and it has in fact been admitted by Dr Price *, and thousands of others who reject the doctrine of materialism, as an impious absurdity. The second illustration

* Corr[espondence] with Priestl[ey]

lustration, however, is more to the purpose; and as it is not new, we shall give it an old answer.

Why do not we perceive external objects in our *sleep* or in a *swoon*? "Because (says Mr Wollaston), † the *passages* are become impracticable, the *windows* shut, and the *nerves* being obstructed, or somehow rendered for the time useless, can transmit no information to it. Why, however, does it not reason and think about *something or other*? Because, all the *marks* by which things are remembered, being for the present choked up or disordered, the remembrance of those *objects* about which it is wont to employ itself, and even of the words (or other signs) in which it uses to reason, and to preserve the deductions and conclusions it makes, is all suspended at least for the time; and so its tables being covered, its books closed, and its tools locked up, the requisites for reasoning are wanting, and no subject offers itself to exercise its thoughts, it having yet had little or no opportunity to take in *higher objects* and more *refined matter* for contemplation. And, to conclude, if it be demanded, Why any one should imagine that the *soul* may think, perceive, act, *after death*, when it doth not do this in sleep, &c.? the answer is, Because those *inclosures* and *impediments* which occasioned the forementioned intermissions, and those great limitations under which it labours at all times, will be removed with its enlargement out of the body. When it shall in its *proper vehicle* be let go, and take its flight into the open fields of heaven, it will then be bare to the immediate impressions of objects: And why should not those impressions which affected the *nerves*, that moved and affected the vehicle and soul in it, *affect the vehicle immediately* when they are immediately made upon it, without the interposition of the nerves? The hand which feels an object at the end of a *staff*, may certainly be allowed to feel the same much better by *immediate contact* without the staff."

The opinion, that the soul is united to some fine vehicle, which dwells with it in the brain, and goes off with it at death, was not peculiar to Mr Wollaston. It was thought extremely probable by Dr Hartley, and shall be shown afterwards to have been a very ancient opinion; but we do not quote it at present as either well or ill founded, but only as sufficient, in conjunction with the reasoning of its author, to obviate the force of Dr Priestley's second illustration of his argument for the materiality of mind, provided the argument itself be not more powerful than any which the immaterialists can bring against it.

The Doctor's third illustration we have already obviated, when we accounted for the mind and the body mutually affecting each other; and we might refer to Dr Price's answer (E) to the fourth, as being, in our opinion, a full confutation of it. But as that author's notions of *mind* and *ideas* differ in some respects from our own, we shall examine this objection to the doctrine of the immaterialists upon principles which we believe Dr Priestley more inclined to admit.

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That the sentient principle in man, if it be immaterial, can have no extension, is a truth which we think cannot be controverted; and if so, every thing in that principle must be *simple* and *indivisible*. Thus far we agree with Dr Priestley; but with respect to what follows we differ from him entirely. The agitation in the brain, which is the immediate cause of sensation, must indeed correspond to the impression *ab extra* by which it is produced, and therefore must have the property of extension; but that agitation, whatever it be, is not itself sensation any more than a bludgeon is a blow or a sword is a wound. Dr Priestley, indeed, in answer to Dr Price, affirms, that, according to Hartley's theory, ideas are only *vibrations in the brain*; but whoever shall take the trouble to examine that theory himself, will not find that its author ever advances such an opinion, or considers vibrations as any thing more than the instruments by which sensations and ideas are excited in the sentient principle. A real and proper idea, as we have often repeated, is nothing else than a fainter sensation: but no sensation, from whatever cause it may proceed, is itself extended; nor could we, without memory, the reasoning faculty, and the power of local motion, have acquired from mere sense any notion of extension at all: (See sect. 3. chap. i. Part I. Sensations and ideas are those *appearances* (if we may so say), which vibrations or some other motion in the brain excite in the mind; but a *half* appearance is an absurdity. A man may view *half a tree* with his eyes, and he may contemplate the idea of *half a tree* in his mind; but he cannot have *half a view* or *half an idea* of any thing. Sensations and ideas result from the mutual agency of the brain and sentient principle upon each other; and if the agency of the brain be vibration, more of it may vibrate at one time than at another: but surely the mere relation between its agency at any time and the agency of the mind, can neither have extension nor be divisible; for who ever thought of extending or dividing relations? On this subject it is extremely difficult to write with perspicuity and precision; and what we have said may very possibly be misunderstood. Our notion is to ourselves clear and determinate; but language which was not invented by metaphysicians, wants words in which it may be properly expressed. Perhaps the reader may understand what we mean, when we say that a sensation or an idea is the instantaneous effect of the mutual agency of the brain and sentient principle. Of this we think every man, by a little attention, may be perfectly convinced, though it may be impossible ever to discover the precise nature

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(E) In *Disquisitions*, p. 37 and 102, it is asserted, that ideas are certainly divisible. "This seems to me very absurd. It would be as proper to assert ideas to be hard or round. The idea of an object is the apprehension, view, or notion of it; and how can this be divisible? Perception is a single and indivisible act. The object perceived may be divisible; but the *perception* of it by the mind cannot be so. It is said in page 95, *that if ideas are not things distinct from the mind, a mind with ideas and a mind without ideas would be the same.*—I maintain, that ideas are not distinct from the mind, but its conceptions; or not *things* themselves, but *notions* of things. How does it follow from hence, that a mind with or without ideas is the same? It would seem that this follows much more from the contrary assertion." *Correspondence between Dr Price and Dr Priestley.*

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ture of this agency; and if fo, it is plain that fenfations and ideas cannot be divided, for no inftantaneous effect of any kind is divifible. A fenfation, and of courfe a fimple and original idea, neither has extenfion itfelf, nor fuggefts the notion of extenfion *ab extra*. By running the hand or any other member along a folid body, we feel continued refiftance: this feeling, or the idea of this feeling, becomes in time fo clofely affociated with all our fenfations of touch and fight, that the one cannot be feparated from the other; and thefe affociations are what Dr Prieftley calls *extended ideas*. Upon the whole then, we think it apparent, that our fenfations, and the relicts of our fenfations, are unextended and indivifible, (F); and that though they fuggeft to us the exiftence of extended things *ab extra*, the fentient being *may* be unextended and indivifible.

Having thus examined Dr Prieftley's auxiliary arguments for the materiality of mind, we now proceed to confider his main and direct proof. To this, as we have obferved, fo able a reply has been made, that it would be injuftice to our readers not to lay it before them, in the words of its author. "I readily acknowledge (fays this fpirited effayift*), that the power of fenfation or perception never having been found but in conjunction with a certain organifed fyftem of matter, we ought, as philofophers, to conclude that this power neceffarily exifts in, and refults from, that organized fyftem, unlefs it can be fhown to be incompatible with other known properties of the fame fubftance. On the other hand, it muft be admitted, that conftant conjunction implies *neceffary* connection only when reafons cannot be difcovered to prove the conjunction to be accidental and arbitrary. In the prefent inftance, it is alleged, that difcerptibility is a property of matter abfolutely incompatible with the property of fenfation or perception; or in other words, that fenfation is a power or property incapable of divifion. But as the power of the entire fyftem is clearly nothing more than the fum or aggregate of the powers of all the parts, it neceffarily follows, that the primary particles of which the fyftem is compofed muft, upon the material hypothefis, poffefs diftinct powers of fenfation; and that thofe

* Eff. Philofophical, Hiftorical, and Literary.

2 Direct proof of the fentient principle in man to be a fet of matter.

(F) We affirm this only of *human* fenfations and ideas, becaufe thefe are the only fenfations and ideas of which we are confcious, and about which we can reafon. Other animals are fentient as well as man, and appear to have their fenfations excited by impreffions *ab extra*; but whether in every fpecies of animals a fingle impreffion excites but one fenfation common to the whole animal, or different fenfations which are felt each by a different faculty or fentient principle, is a queftion which we are not able to anfwer. We make this remark, becaufe from the phenomena of fenfation in the earth-worm and other reptiles, fome philofophers of eminence having fuppofed, that in thefe creatures the fentient faculty belongs to the material fyftem, and is divifible with it; have thence concluded, we think rafhly, that all arguments for the immateriality of the human mind are founded merely on our ignorance. We call this conclufion rafh; becaufe, though we know perfectly what a human fenfation is, we have fo little knowledge of the nature of fenfation in worms, that what may be true of the one *principle* of fenfation may be falfe of the other. Indeed, if we are to judge from the phenomena, this is actually the cafe. It appears from experiments made by Abbé Spallanzani and others, that if a certain number of rings be cut off either from the anterior or pofterior part of a worm, or even from both, the remainder will not only continue to live and be fentient, but will alfo regenerate a new head and a new tail, and become again a complete worm. Nothing like this takes place in man or in the higher orders of animals; and therefore, were it certain that the fentient principle in the worm is diffufed through the whole fyftem and divifible with it, we could not infer that the principle of fuch fenfations as we are confcious of, is likewife extended and divifible. It is, however, fo far from being certain that the fentient principle is diffufed through the whole worm, that nothing neceffarily follows from this fact, but that its feat is at fome diftance from either extremity. Nay, were it true, as perhaps it is, that a worm may be fo divided, as that each of the two fections fhall retain life, fenfation, and this reproductive power, we would not therefore be authorifed to conclude that the fentient principle is *one*, co-extended and divifible with the material fyftem. The earth worm, like many other reptiles, being an hermaphrodite, which unites in itfelf both fexes, may poffibly confift of two animated fyftems; which though united by fome bond of connection, by which fenfation is communicated from the one to the other, are yet in themfelves perfectly diftinct. Should this, upon proper inveftigation, be found to be the cafe; and fhould it likewife be found; that when a worm is divided into three or more parts, only one or two of thefe parts continue to live, there would be no room whatever for fuppofing that even in thefe creatures the principle of fenfation is extended and divifible. In the mere power of reproducing amputated parts, when that power is confidered by itfelf, there is nothing more wonderful than in the growing of the nails of our fingers or the hairs of our heads. The only thing which feems to militate againft the fimplicity of the principle of fenfation in worms, is the continuance of life, &c. with both parts of a worm when cut into two by a knife or pair of fciffars; but if a worm be found to have two feats of fenfation analogous to the brain in higher animals, and if it be likewife found that life continues only in fuch fections as retain at leaft one feat of fenfation, the fentient principle in the worm may be as fimple and indivifible as in any animal whatever. We neither wifh nor expect much ftrefs to be laid upon thefe hints and conjectures. Should they induce any of our phyfiological readers, who have leifure, and are at the fame time fkilled in philofophy, properly fo called, to inftitute a fet of experiments upon worms, and fuch reptiles, and to trace apparent effects to their heigher caufes, they might eventually lead to important difcoveries. In the mean time, it is fufficient for our purpofe to obferve, that whatever be the fentient principle or principles in the earth-worm, it is obvious that the whole animal cannot in any cafe be confcious, as man undoubtedly is, of *one individual fenfation*; and that therefore no arguments built upon the phenomena accompanying fenfation in worms, can be of any importance in the controverfy about the materiality or immateriality of the human mind.

those powers combined constitute the indivisible power of sensation belonging to the system; or, in other words, that the *indivisible* power of sensation is a *divisible* power, nay, an infinitely divisible power, if matter be, as philosophers in general allow, an infinitely divisible substance—a conclusion obviously and grossly ridiculous. We are then compelled to acknowledge, that sensation or perception is not the property of a material substance; *i. e.* if the common mode of expression be retained, it is the property of an immaterial substance; or, to avoid verbal contention, it is a property not resulting from, or necessarily connected with, the organical system, but a property wholly foreign, superinduced, and adventitious. (G)

"In opposition to this reasoning, the materialists affirm, that entire systems may possess, and they think themselves warranted to pronounce that organized systems of matter actually do possess, powers essentially different from those which inhere in the several parts. Amongst various familiar though striking illustrations of this truth, it has been said, that a rose possesses the property of sweetness or fragrance, a globe the property of sphericity, a harpsichord the property or power of producing harmony, *aqua regia* the property of dissolving gold, &c. though the component particles of these different organized systems are themselves totally destitute of the powers and properties here enumerated.

"The immaterialists, in reply, assert, that it is not only false in fact, but a direct contradiction, and an absolute impossibility in the nature of things, that a system should possess any property which does not inhere in its component parts. To assert that the power of the whole is the sum or aggregate of the powers of all the parts, is an identical and self-evident proposition, the whole and all the parts being terms precisely synonymous. Whoever, therefore, calls in question the truth of this axiom, must maintain that the power of the whole is something different from the power of all the parts, *i. e.* that the power of the whole is *not* the power of the whole.

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"It will be easy to demonstrate the correspondence of facts with this plain and simple theory. For this purpose, it is necessary to observe, that the properties of matter, or what are generally denominated such, may be divided into real and nominal, which Locke and others have called primary and secondary qualities. Figure, magnitude, and motion, are qualities really inherent in matter; but figure, magnitude, and motion, eternally varied, can produce only different combinations of figure, magnitude, and motion. There are also powers, or qualities, vulgarly considered as inherent properties of matter organically disposed, which are really and truly qualities or affections of the mental or percipient principle, and have no existence when not perceived. Thus the sweetness or fragrance of the rose, considered as mere sweetness and fragrance, can be nothing but an affection of the mind; considered as a quality of the rose, they can mean nothing more than a certain arrangement, configuration, and motion of parts, which in some inexplicable manner produces the sensation of sweetness. In this instance, therefore, the power of the whole is plainly the aggregate of the powers residing in the parts, by the motion and organization of which a certain effect is produced upon a foreign and percipient substance.

"But a globe, we are told, possesses the property of sphericity, though not a single particle amongst that infinite number of which the globe is constituted is itself of a spherical form. The fallacy of

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(G) This argument is not new. It was long ago urged by Dr Clarke against Mr Dodwell; and some of our readers may not be ill pleased to see it stated by so masterly a reasoner: "That the soul cannot possibly be *material*, is demonstrable from the single consideration of bare sense or consciousness. For matter being a divisible substance, consisting always of separable, nay of actually separate and distinct parts, it is plain that unless it were essentially conscious, in which case every particle of matter must consist of innumerable separate and distinct consciousnesses, no system of it, in any possible composition or division, can be an individual conscious being. For suppose three or three hundred particles of matter, at a mile or any given distance one from another, is it possible that all these separate parts should in that state be one individual conscious being? Suppose then all these particles brought together into one system, so as to touch one another, will they thereby, or by any motion or composition whatsoever, become one whit less truly distinct beings than they were when at the greatest distance? How then can their being disposed in any possible system make them one individual conscious being? If you will suppose God by his infinite power superadding consciousness to the united particles, yet still these particles being really and necessarily as distinct beings as ever, cannot be *themselves* the *subject* in which that individual consciousness inheres; but the consciousness can only be superadded by the addition of something, which in all the particles must still itself be but one individual being. The soul, therefore, whose power of thinking is undeniably one individual consciousness, cannot possibly be a material substance." *Clarke's Letter to Mr Dodwell, 2d edition.*

That the same mode of reasoning was known to the ancients, Cudworth has shown by numerous quotations; and as an argument certainly loses nothing by antiquity, or by having occurred to thinking men in distant ages, we shall lay before our readers two passages from Plotinus, of which the extract from Clarke's letter (though we are persuaded it was not borrowed by the author) must be considered as little more than a paraphrastical translation. ——τι τοινυν φησουσιν, οἱ την ψυχην σωμα ειναι λεγοντες, πρωτον μεν περι ἑκαστου μερους της ψυχης της εν τω αυτω σωματι, ποτερον ἑκαστον ψυχη, οἱα εστι και ἡ ὁλη; και παλιν του μερους το μερος; ουδεν αρα το μεγεθος συνεβαλλετο τη ουσια αυτης· καιτοι εδει γε ποσου τινος οντος· αλλα και ὁλον πολλαχη, ὁπερ σωμασι παρειναι αδυνατον, εν πλειοσι το αυτο ὁλον ειναι, και το μερος ὁπερ το ὁλον, ὑπαρχειν· ει δε ἑκαστον των μερων, ου ψυχην φησουσιν, εξ αψυχων ψυχη αυτοις υπαρξει. *En.* IV. *Lib* 7timo. *Cap.* 5.

The same argument is elsewhere stated thus: ει δε ἑκαστον ζωην εχοι, και εν αρκει· ει δε μηδενος αυτων ζωην εχοντος ἡ συνοδος πεποιηκε ζωην, ατοπον· μαλλον δε αδυνατον συμφορησιν σωματων ζωην εργαζεσθαι, και νουν γενναν τα ανοητα. *En.* IV, *Lib.* 7. *Cap.* 2.

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of this illuftration is, however, as eafily demonftrable as that of the former. The fphericity of a globe is evidently the fum or aggregate of the curvilinear or convex parts which compofe its furface; and the property of the whole is neither more nor lefs than the combined properties of all its parts. No one doubts, that by new compofitions or arrangement of material particles poffeffing magnitude, figure, and motion, an endlefs diverfity of phenomena may be produced, to which it may be neceffary to apply new names. New names, however, do not conftitute new properties; and though we give to a globe the appellation of an entire fyftem, and afcribe to it the property of fphericity, we know at the fame time that it is really nothing more than a collection of thoufands of millions of particles, actually feparate and diftinct, arranged in that particular form which we denominate fpherical. But this can never be regarded as in the remoteft manner analogous to the *creation* of the power of perception, in confequence of a certain organical arrangement or difpofition of impercipient particles. Though fphericity is, indeed, the property of the entire fphere, yet every part of the fphere, if divided, poffeffes its fhare of fphericity. But if the percipient principle be divided, what would become of the power of perception? A fphere equally divided becomes two hemifpheres; does a perception, when divided in like manner, become two demi-perceptions?

"The fame reafonings may eafily be transferred, and applied to the harpfichord. Can any one be abfurd enough to affirm that the power of harmony refides in the harpfichord, as the power of perception does in the mind? After the utmoft fkill of the artificer has been exerted, we difcover nothing more in the harpfichord than new modifications of the old properties of figure, magnitude, and motion, by means of which certain vibrations are communicated to the air, which, conveyed by the medium of the auditory nerves to the fenforium, produce the fenfation of harmonic founds. Thefe new modifications are therefore attended, indeed, with new and very wonderful effects; but then thofe effects are produced upon, and are themfelves modifications of, the fentient or percipient faculty. And though it is wholly incomprehenfible to us in what manner thefe effects, that is, thefe *fenfations*, are produced, we well know, and perfectly comprehend, that they are not new powers belonging to any organized fyftem of matter; that they have no exiftence but in a mind perceiving them; and that they are far from militating againft that grand and univerfal axiom, that the power of the whole is nothing more than the united powers of all the parts.

"As to the laft inftance adduced, of the power of *aqua regia* to diffolve gold, though neither the fpirit of falt, nor the fpirit of nitre of which it is compounded, feparately poffeffes that power, it is plain, that from the union of thefe two fubftances, certain new modes of configuration and motion refult; and the folution of gold is the confequence of this new arrangement and motion of the parts. But the particles of which the menftruum is compofed were always poffeffed of the properties of figure and motion; and what is ftyled a new property, is clearly nothing more than a new effect of the old properties differently modified. In a word, the advocates for materialifm may fafely be challenged to produce, in the whole compafs of nature, a cafe which bears the leaft analogy to that which thefe inftances are moft unphilofophically adduced to prove and to illuftrate. It is an abfurdity which tranfubftantiation itfelf does not exceed, to maintain that a whole is in reality any thing different from its component parts; and all nature rifes up in confutation of an affertion fo monftrous and extravagant. To affirm that perception can arife from any combination of impercipient particles, is as truly ridiculous, as to affirm that a combination of the feven primary colours with the four cardinal virtues may conftitute a planet. It is equivalent to an affertion, that an epic poem might be compofed of parallelograms, cones, and triangles. In a word, it is an abfurdity not lefs real, and little lefs obvious, than that of the blind man who thought that the idea of a fcarlet colour refembled the found of a trumpet."

If matter be taken in the common acceptation, to be a folid, extended, and inert fubftance, this reafoning for the immateriality of the fentient principle in man appears to us to have the force of demonftration, which no difficulties or partial objections, arifing from our inability to conceive the bond of union between two fuch heterogeneous fubftances as mind and body, can ever weaken, and far lefs overturn. But the modern materialifts deny that matter is either folid or inert. "All thofe facts (fay they) which led philofophers to fuppofe that matter is impenetrable to other matter, later and more accurate obfervations have fhown to be owing to *fometl ing elfe* than folidity and impenetrability, viz. a *power of repulfion*, which for that reafon they would fubftitute in its place. The property of *attraction* or repulfion (fays Dr Prieftley) appears to me not to be properly what is *imparted* to matter, but what really *makes it to be what it is*; infomuch, that without it, it would be nothing at all; and as other philofophers have faid,—'Take away folidity, and matter vanifhes,' fo I fay, 'Take away attraction and repulfion, and matter vanifhes." If this be admitted, the ingenious author hopes that we fhall not confider matter with that contempt and difguft with which it has generally been treated, there being nothing in its real nature that can juftify fuch fentiments refpecting it.

23 Reply the m… rialist shown

We know not why, upon any hypothefis, matter fhould be viewed with contempt and difguft.—Whether penetrable or impenetrable, every confiftent theift confiders it as one of the creatures of God perfectly fitted to anfwer all the purpofes for which it was intended: but were it really deftitute of folidity, and endowed with the powers of attraction and repulfion, we fhould ftill be obliged to confider it as incapable of the powers of fenfation and thought. If we have any notion at all of what is meant by centres of attraction and repulfion (of which indeed we are far from being confident), it appears to us to be intuitively certain, that nothing can be the refult of any poffible combination of fuch centres, but new and more enlarged fpheres of attraction and repulfion. But furely confcioufnefs, fenfation, and will, are as different from attraction and repulfion, as a cube is from the found of a trumpet, or as the fenfations of a felon in the agonies of death are from the attraction of the rope by which he is hanged. If this be admitted, and

23 …o be … furd.

and we are perſuaded it will be denied by no man whoſe underſtanding is not clouded by an undue attachment to paradoxes, the ſentient principle cannot poſſibly be matter: for if, when the powers of attraction and repulſion are taken away, matter vaniſhes; and if conſciouſneſs and ſenſation are not attraction and repulſion; it is not more evident that three and two are not nine, than that the ſubſtance which attracts and repels cannot be that which is conſcious and percipient.

Locke, who was certainly no materialiſt, as he repeatedly affirmed, and indeed demonſtrated, that thought could never be the reſult of any combinations of figure, magnitude, and motion, was yet of opinion, that God by his almighty power might endow ſome ſyſtems of matter with the faculties of thinking and willing. It is always with reluctance that we controvert the opinions of ſo great a man; and it is with ſome degree of horror that we venture in any caſe to call in queſtion the power of Omnipotence.—But Omnipotence itſelf cannot work contradictions; and it appears to us nothing ſhort of a contradiction, to ſuppoſe the individual power of perception inhering in a ſyſtem which is itſelf extended and made up of a number of ſeparate and diſtinct ſubſtances. For let us ſuppoſe ſuch a ſyſtem to be ſix feet long, three feet broad, and two feet deep (and we may as well ſuppoſe a ſyſtem of theſe dimenſions to be percipient, as one that is ſmaller), then it is plain, that every idea muſt be extended, and that part of it muſt be in one place, and part in another. If ſo, the idea of a ſquare inch will be ſix feet long, three feet broad, and two feet deep; and what is ſtill harder to be digeſted, the ſeveral parts of this idea will be at a great diſtance from each other, without any bond of union among them. The being which apprehends one extremity of the idea, is, by the ſuppoſition, ſix feet diſtant from the being which apprehends the other extremity; and though theſe two diſtinct beings belong to one ſyſtem, they are not only ſeparable, but actually ſeparated from each other as all the particles of matter are. What is it then that apprehends as *one* the whole of this extended idea? Part of it may be apprehended by one particle of matter, and part of it by another; but there is nothing which apprehends, or can apprehend, the whole. Perhaps it will be ſaid, the power of apprehenſion is not divided into parts, but is the power of the one ſyſtem, and therefore apprehends at once the whole idea. But a power or faculty cannot be ſeparated from its ſubject, power which inheres in nothing being confeſſedly impoſſible; and a material ſyſtem is not *one ſubject* in which any individual power or faculty can inhere. There muſt, therefore, be united to the ſyſtem ſome *one* being, which is the ſubject of thought, and which is unextended as well as indiviſible. This, we ſay, follows undeniably. For, let us ſuppoſe, that an extended being without ſeparable parts is poſſible, and that ſuch a being is percipient; it is obvious, that the whole of any one of its perceptions could not be in one place. Now, though we ſhould grant to Dr Prieſtley and other materialiſts, that every idea of an extended ſubſtance has itſelf three dimenſions, and is incorporated and commenſurate with the whole percipient ſyſtem; what, upon this ſuppoſition, ſhall we think of conſciouſneſs and of the perception of truth? Is conſciouſneſs or truth extended? If ſo, one ſide or ſuperficies of conſciouſneſs, or of a truth, may be greater or leſs than another, above or below, to the right or to the left; and it will be very proper and philoſophical to ſpeak of the length, breadth, and depth, of conſciouſneſs or of truth. But ſurely to talk of the place, or the extenſion of theſe things, is as abſurd as to talk of the colour of ſound, or the ſound of a triangle; and we might as well ſay, that conſciouſneſs is green or red, as that it is an ell or an inch long; and that truth is blue, as that it has three dimenſions.

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239 *because the ſentient being cannot be extended.*

This reaſoning is ſomewhat differently ſtated by Cudworth; who obſerves, that if the ſoul be an extended ſubſtance, "it muſt of neceſſity be either a phyſical point (*i. e.* the leaſt extenſion poſſible, if there be any ſuch leaſt extenſion), or elſe it muſt conſiſt of more ſuch phyſical points joined together. As for the former of theſe, it is impoſſible that *one ſingle atom*, or *ſmalleſt point* of extenſion, ſhould be able to perceive diſtinctly all the *variety* of things, *i. e.* take notice of all the *diſtinct* and *different* parts of an *extended object*, and have a *deſcription* or *delineation* of the whole of them upon itſelf (for that would be to make it the leaſt, and not the leaſt, poſſible extenſion at the ſame time:) Beſides, to ſuppoſe every ſoul to be but one *phyſical point*, or the ſmalleſt *poſſible extenſion*, is to ſuppoſe ſuch an eſſential difference in matter or extenſion, as that ſome of the *points* thereof ſhould be *naturally* devoid of all *life*, *ſenſe*, and *underſtanding*; and others, again, naturally *ſenſitive* and *rational*. And even ſhould this abſurdity be admitted, it would yet be utterly inconceivable how there ſhould be *one*, and *but one*, *ſenſitive* and *rational* atom in every man; how this atom of ſo *ſmall* dimenſions ſhould actuate the whole ſyſtem; and how it ſhould conſtantly remain the ſame from infancy to old age, whilſt all the other parts of the ſyſtem tranſpire perpetually, and are ſucceeded by new matter (H).

"But if, according to the ſecond hypotheſis, ſouls be

(H) Should it be ſaid, that this eſſential difference between the atoms of matter is not fortuitous; that ſome of them are created intelligent for the expreſs purpoſe of animating ſyſtems of others which are unintelligent; and that theſe intelligent atoms do not operate upon the ſyſtems with which they are united, by the *vis inertiæ*, *ſolidity*, or *extenſion*, of matter, but by the energies of underſtanding and will: Should this (we ſay) be alleged, ſurely it may be aſked, for what purpoſe they are conceived to have the quality of extenſion? It is evidently of no uſe; and it has been already ſhown, and ſhall be more fully ſhown afterwards, that by our notions of conſciouſneſs and underſtanding, we are ſo far from being led to ſuppoſe the ſubject of theſe powers extended, that we cannot ſuppoſe any relation whatever between them and extenſion. But if theſe intelligent atoms be diveſted of their quality of extenſion, they will be transformed from matter to mind, and become the very things for the exiſtence of which we plead.

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be extended ſubſtances conſiſting of many points one without another, and all concurring in every ſenſation; then muſt every one of theſe points perceive either a *point* only of the object, or elſe the *whole*. Now, if every *point* of the *extended ſoul* perceives only a *point* of the *object*, then is there no *one thing* in us that perceives the whole, or that can compare one part of the object with another. On the other hand, if every *point* of the *extended ſoul* perceive the *whole object* at once, then would there be *innumerable perceptions* of the ſame object in every ſenſation; as many, indeed, as there are points in the extended ſoul — And from both theſe ſuppoſitions it would alike follow, that no man is *one ſingle percipient* or perſon, but that in every man there are innumerable diſtinct *percipients* or *perſons*; a concluſion directly contrary to the infallible evidence of conſciouſneſs (1)."

Cogent as theſe arguments for the immateriality of the ſentient principle appear to be, they have been lately treated with the moſt ſovereign contempt by a writer who profeſſes to be a diſciple of Dr Prieſtley's, but who ſeems not to have learned the modeſty or the candor of his maſter. Dr Prieſtley labours to prove, that to account for the phenomena of perception and volition, &c. it is not neceſſary to ſuppoſe an immaterial principle in man. Mr Cooper with greater boldneſs affirms, and undertakes to demonſtrate with all the parade of mathematical preciſion ‡, that ſuch a principle is impoſſible. Though the authority of this philoſopher in ſuch inquiries as depend not immediately upon the retort and the furnace, is certainly not great, he yet utters his dogmas with ſuch confidence, that it may not be improper to examine the chief arguments upon which they reſt.

‡ *Tracts Ethical, Theological, and Political*, Vol. I.

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An attempt to prove the impoſſibility of an immaterial ſubſta[nce].

" Suppoſe (ſays he) the ſoul to have no common property with matter; then, nothing can act upon any other but by means of ſome common property. Of this we have not only all the proof that induction of known and acknowledged caſes can furniſh, but that additional proof alſo which ariſes from the impoſſibility of conceiving how the oppoſite propoſition *can* be true. But by the ſuppoſition, the ſoul has no property in common with matter; and therefore the ſoul cannot act upon matter. But by the ſuppoſition of every ſyſtem of immaterialiſm (except thoſe of Malbranche, Berkeley, and Leibnitz), it is deemed an eſſential property of the ſoul, that it acts upon the body, or upon matter; therefore the ſoul can and cannot act upon matter at the ſame time, and in the ſame reſpect. But this is a contradiction in terms; and as two contradictions cannot both be true at the ſame time, the ſuppoſition of the exiſtence of an immaterial ſoul cannot be true; that is, the ſoul does not exiſt."

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Shown to be fut[ile].

This reaſoning, the reader will obſerve, is carried on with all the pomp of mode and figure. The propoſitions hang upon each other like the ſeveral ſteps of an algebraic proceſs: but as in ſuch proceſſes one error unwarily admitted produces a falſe reſult, ſo in demon-

(1) As the materialiſts endeavour to prejudice the public againſt the notion of an unextended ſoul, by repreſenting it as a fiction of *Des Cartes*, altogether unknown to the ancients, it may not be improper to give our readers an opportunity of judging for themſelves how far this repreſentation is juſt.— *Plotinus*, reaſoning about the nature of the ſoul from its energies of ſenſation, expreſſes himſelf in theſe words:—ειτι μελλει αισθανεσθαι τινος, ἑν αυτο δει ειναι, και τω αυτω παντος αντιλαμβανεσθαι και ει δια πολλων αισθητηριων πλειω τα εισιοντα, η πολλαι περι ἑν ποιοτητες και δι ἑνος ποικιλον, οἱον προσωπον· ου γαρ αλλο μεν ρινος αλλο δε οφθαλμων, αλλα ταυτον ὁμου παντων· και ει το μεν δι ομματων το δε δι ακοης, ἑν τι δει ειναι εις ὁ αμφω· η πως αν ειποι ὁτι ἑτερα ταυτα, μη εις το αυτο ὁμου των αισθησεων ελθοντων. "That which perceives in us, muſt of neceſſity be one thing, and by one and the ſame indiviſible perceive all; and that whether they be more things entering through ſeveral organs of ſenſe, as the many qualities of one ſubſtance, or one various and multiform thing, entering through the ſame organ, as the countenance and picture of a man. For it is not one thing in us that perceives the noſe, and another thing the eyes; but it is one and the ſelf-ſame thing that perceiveth all. And when one thing enters through the eyes, another through the ears, both theſe alſo muſt of neceſſity come at laſt to one indiviſible; otherwiſe they could not be compared together, nor one of them be affirmed to be different from the other, the ſeveral ideas of them meeting no where in one place." Purſuing the ſame argument, and having obſerved, that if what perceiveth in us be extended, then one of theſe three things muſt of neceſſity be affirmed, that either every part of this extended ſoul perceives a part only of the object, or every part of it the whole object; or elſe, that all comes to ſome one point, which alone perceives both the ſeveral parts of the object and the whole: he obſerves of the firſt of theſe ſuppoſitions,—μεγεθει οντι τουτω, ξυμμεριζοιτο αν· ωστε αλλο αλλου μερος, και μηδενα ἡμων ὁλου του αισθητου αντιληψιν εχειν· ὡσπερ αν ει εγω μεν αλλου· συ δε αλλου αισθοιο: "If the ſoul be a magnitude, then muſt it be divided, together with the ſenſible object, ſo that one part of the ſoul muſt perceive one part of the object, and another another; and nothing in it, the whole ſenſible; juſt as I ſhould have the ſenſe of one thing, and you of another." Of the ſecond ſuppoſition, he writes in this manner: ει δε ὁτιουν παντος αισθησεται· εις απειρα διαιρεισθαι του μεγεθους πεφυκοτος, απειρους και αισθησεις καθ ἑκαστον αισθητον συμβησεται γιγνεσθαι ἑκαστω οἱον του αυτου απειρους εν τω ἡγεμονουντι ἡμων εικονας: "But if every part of the extended ſoul perceive the whole ſenſible object, ſince magnitude is infinitely diviſible, there muſt be in every man infinite ſenſations and images of one object." —And as for the third and laſt part of this disjunction, Plotinus by aſſerting the infinite diviſibility of body, here ſhows that the ſuppoſition of any one phyſical point is in itſelf an abſurdity. But if it were not, he agrees with Ariſtotle in aſking πως τω αμερει το μεριστον·—thereby plainly indicating, that the ſentient principle is totally ſeparated from extenſion, and can neither be conſidered as extended like a ſuperficies or ſolid, nor unextended as a phyſical point.

demonſtrative reaſonings one unſound argument admitted into the premiſſes is neceſſarily productive of error in the concluſion. When the author affirms, "that nothing can act upon any other but by means of ſome common property," he affirms without the ſhadow of proof what is certainly not ſelf-evident. He ſays, indeed, that of this we have all the proof that induction of known and acknowledged caſes can furniſh; but unleſs conſciouſneſs be calculated to deceive us, this is unqueſtionably a miſtake. Matter, he repeatedly affirms, has no other properties than thoſe of attraction and repulſion: but a man moves his arm by a mere energy of will; and therefore, according to this demonſtrator, an energy of will muſt be either material attraction or material repulſion. If ſo, it is reaſonable to conclude, that when a man draws his hand towards his head, the centre of his brain exerts its power of *attraction;* and that when he extends his arm at full length before him, the ſame centre exerts its power of *repulſion.* We beg pardon of our readers for detaining them one moment upon ſuch abſurdities as theſe: yet we cannot diſmiſs the argument without taking the liberty to aſk our all-knowing author, How it comes to paſs that the ſame centre ſometimes attracts and ſometimes repels the ſame ſubſtance at the ſame diſtance; nay, that it both attracts and repels ſubſtances of the ſame kind, at equal diſtances, and at the very ſame inſtant of time? This muſt be the caſe, when a man puts one hand to his head, and thruſts another from him; and therefore, if theſe operations be the effect of attraction and repulſion, it muſt be of attraction and repulſion, to which induction of known and acknowledged caſes furniſhes nothing ſimilar or analogous, *i. e.* of ſuch attraction and repulſion as, according to Mr Cooper's mode of reaſoning, does not exiſt. The truth is, that we are not more certain that we ourſelves exiſt, than that an energy of will is neither attraction nor repulſion; and therefore, unleſs all matter be endued with will, it is undeniable, that, whatever be the ſubſtance of the ſoul, one thing acts upon another by a property not common to them both. In what *manner* it thus acts, we pretend not to know: but our ignorance of the *manner* of any operation is no argument againſt the *reality* of the *operation itſelf*, when we have for it the evidence of conſciouſneſs and daily experience; and when the author ſhall have explained to general ſatisfaction how material centres attract and repel each other at a diſtance, we ſhall undertake to explain how one thing acts upon another with which it has no common properties.

Suſpicious, as it ſhould ſeem, that this reaſoning has not the complete force of mathematical demonſtration, the author ſupports his opinion by other arguments. "Whatever we know (ſays he), we know by means of its properties, nor do we in any caſe whatever certainly know any thing but theſe; and we infer in all caſes the exiſtence of any thing which we ſuppoſe to exiſt from the exiſtence of its properties. In ſhort, our idea of any thing is made up of a combination of our ideas of its properties. Gold is heavy, ductile, tenacious, opake, yellow, ſoluble in *aqua regia*, &c. Now, let any one ſuppoſe for an inſtant that gold is deprived of all theſe, and becomes neither heavy, ductile, tenacious, opake, yellow, ſoluble, &c. what remains, will it be gold? Certainly not. If it have other properties, it is another ſubſtance. If it have no properties remaining, it is nothing. For nothing is that which hath no properties. Therefore, if any thing loſe all its properties, it becomes nothing; that is, it loſes its exiſtence. Now, the exiſtence of the ſoul is inferred, like the exiſtence of every thing elſe, from its ſuppoſed properties, which are the phenomena of thinking, ſuch as perception, recollection, judgment, and volition. But in all caſes of *perfect* ſleep, of the operation of a ſtrong narcotic, of apoplexy, of ſwooning, of drowning where the vital powers are not extinguiſhed, of the effects of a violent blow on the back part of the head, and all other leipothymic affections, there is neither perception, recollection, judgment, nor volition; that is, all the properties of the ſoul are gone, are extinguiſhed. Therefore, the ſoul itſelf loſes its exiſtence for the time. If any man ſhall ſay, that theſe properties are only *ſuſpended* for the time, I would deſire him to examine what idea he annexes to this ſuſpenſion; whether it be not neither more nor leſs than that *they are made not to exiſt for the time.* Either no more is meant, or it is contradictory to matter of fact; and moreover, if more *be* meant, it may eaſily be perceived to involve the archetypal exiſtence of abſtract ideas, and to contradict the axiom, *impoſſibile eſt idem eſſe et non eſſe.*"

143 For the benefit of ſhort-ſighted inquirers, it is to be wiſhed that the author had favoured the public with this *proof* which might have been ſo eaſily brought; for we can diſcern no connection whatever between the ſuſpenſion of the exerciſe of the powers of the mind, and the archetypal exiſtence of abſtract ideas, or the abſurd propoſition that it is *poſſible for the ſame thing to be and not be.* We think, however, that we underſtand enough of this reaſoning which he has given us to be able to pronounce with ſome confidence that it is nothing to the purpoſe. For, in the *firſt* place, we beg leave to obſerve, that between the properties of gold and the powers of thinking, &c. there is no ſimilarity; and that what may be true when affirmed of the one, may be falſe when affirmed of the other. The powers of the mind are all more or leſs active; the enumerated properties of gold are all paſſive. We know by the moſt complete of all evidence, that the exerciſe of power *may be* ſuſpended, and the power itſelf remain unimpaired; but to talk of the ſuſpenſion of the energies of what was never energetic, if it be not to contradict the axiom *impoſſibile eſt idem eſſe et non eſſe*, is certainly to employ words which have no meaning. Yet even this argument from the properties of gold might have led the author to ſuſpect that ſomething elſe may be meant by the ſuſpenſion of the exerciſe of powers, than that *thoſe powers are made not to exiſt for the time.* In a room perfectly dark gold is not yellow; but does it loſe any of its eſſential properties, and become a different ſubſtance, merely by being carried from light to darkneſs? Is a man while in a dark room deprived of the faculty of ſight, and one of the powers of his mind made not to exiſt for the time? The author will not affirm that either of theſe events takes place. He will tell us that gold exhibits not its yellow appearance, merely becauſe the proper medium of light paſſes not from it to the eye of the percipient, and that it is only for want of the ſame medium that nothing is ſeen by us in perfect darkneſs. Here, then,

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ſhown to be equally weak.

then, by his own confeſſion, is a power of the mind, and a property of an external object, both ſuſpended in their energies, without being annihilated; and no proof has yet been brought that all the powers of the mind may not in the ſame manner be ſuſpended in their energies without being made not to exiſt. As light is neceſſary to viſion, but is not itſelf either the thing which ſees or the thing which is ſeen; ſo may the brain be neceſſary to the phenomena of thinking, without being either that which thinks, or that which is thought upon: and as actual viſion ceaſes when light is withdrawn, though the eye and the object both continue to exiſt; ſo may the *energy* of thinking ceaſe when the brain is rendered unfit for its uſual office, though the being which thinks, and the power of thought, continue to exiſt, and to exiſt unimpaired. That this is actually the caſe every man muſt be convinced who believes that in thinking he exerts the ſame powers to-day that he exerted yeſterday; and therefore our author's ſecond demonſtration of the non-exiſtence of mind is, like his firſt, founded upon aſſertions which cannot be granted.

244 A third attempt of the ſame kind

Another of theſe pretended demonſtrations is as follows: "If the ſoul exiſt at all, it muſt exiſt ſomewhere; for it is impoſſible to frame to one's ſelf an idea of any thing exiſting, which exiſts no where. But if the ſoul exiſt ſomewhere, by the terms it occupies ſpace, and therefore is extended; but whatever has extenſion, has figure in conſequence thereof. The ſoul then, if it exiſt, hath the properties of extenſion and figure in common with matter. Moreover, by the ſuppoſition of every immaterial hypotheſis (except thoſe of Malbranche, Berkeley, and Leibnitz), it acts upon body, *i. e.* upon matter; that is, it attracts and repels, and is attracted and repelled, for there is no conceivable affection of matter but what is founded on its properties of attraction and repulſion; and if it be attracted and repelled, its re-action muſt be attraction and repulſion. The ſoul then has the properties of extenſion, figure, attraction, and repulſion, or ſolidity. But theſe compriſe every property which matter, as ſuch, has ever been ſuppoſed to poſſeſs. Therefore the ſoul is matter, or material. But by the ſuppoſition it is immaterial; therefore it does not exiſt. For nothing can exiſt whoſe exiſtence implies a contradiction."

245 ſhown to confute itſelf.

Mr Cooper, we ſee, ſtill proceeds in the direct road of mathematical demonſtration; but in the preſent inſtance we beg leave to ſtop him in the very beginning of his courſe, and to aſk *where* the univerſe exiſts? When he ſhall have given ſuch an anſwer to this queſtion as men of common ſenſe may be able to comprehend, we may perhaps attempt to tell him where an unextended ſoul exiſts. If this demonſtration be not a collection of words without meaning, the exiſtence of ſpace as a real thing is taken for granted. Space, therefore, has extenſion, and of courſe figure; but we believe Mr Cooper will find ſome difficulty in aſcertaining the figure of infinite ſpace. The mind certainly acts upon body. For this we have the evidence of conſciouſneſs and experience; but we have no evidence whatever that it muſt therefore attract and repel, and be attracted and repelled. It has been already obſerved, that the mind, whatever be its ſubſtance, acts upon the body by energies of will. What theſe are every man knows with the utmoſt certainty and preciſion, whilſt we may venture to aſſert that no man knows preciſely what corpuſcular attraction and repulſion are, ſuppoſing the exiſtence of ſuch powers to be poſſible. When we ſpeak of attraction and repulſion, we have ſome obſcure notion of bodies acting upon each other at a diſtance; and this is all that we know of the matter. But when we think of an energy of the human will, the idea of diſtance neither enters nor can enter into our notion of ſuch an energy. Theſe are facts which we pretend not to prove by a mathematical or a chemical proceſs. Every man muſt be convinced of their truth by evidence more complete than any proof, *viz.* immediate conſciouſneſs of his own thoughts and volitions. This being the caſe, we may turn Mr Cooper's artillery againſt himſelf, and, becauſe mind acts upon body by powers different from attraction and repulſion, argue that body neither attracts nor repels; and were it true, as it is certainly falſe, that nothing could act upon another but by means of ſome property common to both, we might infer that every atom of matter is endowed with the powers of volition and intelligence, and by conſequence that every man is not one but ten thouſand conſcious beings, a concluſion which our philoſopher ſeems not inclined to admit.

24[6] Objections to the doctrine of materialiſm ſtated and anſwered.

Having finiſhed his *demonſtrations*, the author ſtates other objections to the doctrine of immaterialiſm, which, as they are not his own nor new, have greater weight. "It appears no more than reaſonable (ſays he), that if the doctrine of materialiſm be rejected as inadequate to explain the phenomena, theſe latter ſhould at leaſt be explained in ſome manner or other better upon the *ſubſtituted* than the *rejected* hypotheſis; ſo that it is reaſonable to require of an immaterialiſt that his ſuppoſition of a diſtinct ſoul ſhould explain the *rationale* of the phenomena of thinking. But, ſtrange to ſay, ſo far from attempting to explain theſe phenomena on the immaterial hypotheſis, it is acknowledged on all hands that even on this hypotheſis the phenomena are inexplicable." This objection it would certainly be no difficult taſk to obviate; but from that trouble, ſmall as it is, we are happily exempted by the objector. "I would have it underſtood (ſays he), that no materialiſt ever undertook to ſay *how* perception reſults from our organization. What a materialiſt undertakes to aſſert is, that perception, *whatever* it be, or *however* it reſults from, does actually reſult from our organization." According to Mr Cooper, then, the *rationale* of thinking is equally inexplicable by materialiſts and immaterialiſts; and the truth is, that we know the *rationale* of hardly any one operation in nature. We ſee that the ſtroke of a racket produces motion in a billiard ball; but how it does ſo, we believe no man can ſay. Of the fact, however, we are certain; and know that the motion is produced by ſome power, about the effects of which we can reaſon with preciſion. In like manner we know with the utmoſt certainty, that we ourſelves have the powers of perception and volition; and that theſe powers cannot be conceived as either an ell or an inch long. How they reſult from the mutual agency of an immaterial and material ſubſtance upon each other, we are indeed profoundly ignorant; but that ſuch is the fact, and that they are not the reſult of mere organiſation, we muſt neceſſarily believe, ſo long as it is true that the power of the entire ſyſtem is nothing more than

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the sum or aggregate of the powers of all its parts. The immaterial hypothesis contains in it something inexplicable by man: The material hypothesis likewise contains, by the confession of its advocates, something that is equally inexplicable; and is over and above burdened with this contradiction, that the whole is something different from all its parts. It is therefore *no* "singular phenomenon in literary history, that one hypothesis should be rejected as indequate to account for appearances, and that the hypothesis substituted should, even by the acknowledgement of its abettors, be such as not only not to explain the *rationale* of the appearances, but, from the nature of it, to preclude all hopes of such an explanation." This is exactly the case with respect to a *vacuum* in astronomy. That hypothesis does not in the least tend to explain the rationale of the motions of the planets; but yet it must be admitted in preference to a *plenum*, because upon this last hypothesis motion is impossible.

7 Whether any thing can be asserted of the soul [as] of the body.

"Supposing the existence of the soul, it is an unfortunate circumstance (says Mr Cooper), that we cannot properly assert positively any thing of it at all." Were this the case, it would indeed be a very unfortunate circumstance; but can we not assert positively as many things of the soul as we can of the body? Can we not say with as much propriety and certainty, that the soul has the powers of perception and volition, &c. as that the body is solid and extended, or as that matter has the powers of attraction and repulsion? We know perfectly what perception and volition are, though we cannot have *ideas* or mental images of them; and if our author knows what attraction and repulsion are, we believe he will not pretend to have of them ideas entirely abstracted from their objects. "But granting the soul's existence, it may be asked (says he), Of what use is an hypothesis of which no more can be asserted than its existence?" We have just observed, that much more can be asserted of the soul than its existence, viz. that it is something of which perception and will are properties; and he himself asserts nothing of matter but that it is something of which attraction and repulsion are properties.

"This soul, of which these gentlemen (the immaterialists) are conscious, is immaterial essentially. Now, I deny (says our author), that we can have any idea at all of a substance purely immaterial." He elsewhere says, that nothing can exist which is not extended, or that extension is inseparable from our notions of existence. Taking the word *idea* in its proper sense, to denote that appearance which external objects make in the imagination, it is certainly true that we can have no *idea* of an immaterial substance; but neither have we, in that sense, any idea of matter abstracted from its qualities. Has Mr Cooper any *idea* of that which attracts and repels, or of attraction and repulsion, abstracted from their objects? He may, perhaps, have, though we have not, very adequate ideas of bodies acting upon each other at a distance; but as he takes the liberty to substitute assertions for arguments, we beg leave in our turn to assert, that those ideas neither are, nor can be, more clear and adequate than our notion of perception, consciousness, and will, united in one being.

248 Extension not inseparable from all notions of existence.

That extension is no otherwise inseparable from our notions of existence than by the power of an early and perpetual association, is evident from this circumstance, that, had we never possessed the senses of sight and touch, we never could have acquired any idea at all of extension. No man, who has thought on the subject, will venture to affirm, that it is absolutely impossible for an intelligent being to exist with no other senses than those of smell, taste, and hearing. Now it is obvious that such a being must acquire some notion of existence from his own consciousness: but into that notion extension could not possibly enter; for neither sounds, tastes, smells, nor consciousness, are extended; and it is a fundamental article of the materialists creed, that all our ideas are relicts of sensation. Since then existence may be conceived without extension, it may be inferred that they are not inseparable from each other; and since cogitation cannot be conceived with extension, we may reasonably conclude that the being which thinks is not extended.

Mr Cooper indeed with his master talks of extended ideas and extended thoughts: but we must assert, in the words of Cudworth, that "we cannot conceive a *thought* to be of such a certain *length*, *breadth*, and *thickness*, measurable by *inches*, *feet*, and *yards*; that we cannot conceive the *half*, or *third*, or *twentieth* part of a thought; and that we cannot conceive every thought to be of some determinate *figure*, such as *round* or *angular*, *spherical*, *cubical*, *cylindrical*, or the like. Whereas if extension were inseparable from existence, *thoughts* must either be mere *non-entities*, or extended into *length*, *breadth*, and *thickness*; and consequently all truths in us (being nothing but complex thoughts) must be long, broad, and thick, and of some determinate figure. The same must likewise be affirmed of volitions, appetites, and passions, and of all other things belonging to cogitative beings; such as knowledge and ignorance, wisdom and folly, virtue and vice, &c. that these are either all of them absolute *non-entities*, or else extended into three dimensions, and measurable not only by *inches* and *feet*, but also by solid measures, such as *pints* and *quarts*. But if this be absurd, and if these things belonging to soul and mind (though doubtless as great realities at least as the things which belong to body) be *unextended*, then must the substances of souls or minds be themselves unextended, according to that of Plotinus, Νους ου, διαστατος αμεριστου, and therefore the human soul cannot be material."

249 That the human mind cannot exert its faculties but in union with some corporeal system, an opinion probable and

Mr Cooper employs many other arguments to prove the materiality of the sentient principle in man; but the force of them extends no farther than to make it in the highest degree probable, that the mind cannot exert its faculties but in union with some organised corporeal system. This is an opinion which we feel not ourselves inclined to controvert; and therefore we shall not make any particular remarks upon that part of our author's reasonings. That an immaterial and indiscerptible being, such as the soul, is not liable to be *dissolved* with the body, is a fact which cannot be controverted: for what has no parts can perish only by *annihilation*; and of annihilation the annals of the world afford no instance. That an immaterial being, endowed with the powers of perception and volition, &c. *may be capable* of exerting these powers in a state of separation from all body, and that at least one immaterial Being does actually so exert them, or other powers analogous to them, are truths which no man whose

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whose arrogance does not surpass his judgment will venture to deny; but the question at present between the most rigid immaterialists and their opponents, is, whether there is ground to think that the human soul is such a being?

Now, when Mr Baxter and his followers confidently affirm, that human perception must *necessarily* subsist after the dissolution of the present mortal and perishable system; and that the soul, when disencumbered of *all body*, will have its faculties greatly *enlarged*; they affirm what to us appears incapable of proof. That a disembodied soul *may* perceive, and think, and act, and that its powers of intellection *may* have a wider range than when they were circumscribed by a corporeal system, which permitted their action upon external objects only through five organs of sense, is certainly *possible*; and the argument by which the materialists pretend to prove it *not* possible, is one of the most contemptible sophisms that ever disgraced the page of philosophy. To affirm, that because our intellectual powers, in their embodied state, seem to decay with the system to which they are united, the mind, when set free, must therefore have no such powers at all, is equally absurd as to say, that because a man shut up in a room which has but one window sees objects less and less distinctly as the glass becomes more and more dimmed, he must in the open air be deprived of the power of vision. But because the human soul *may*, for any thing that we see to the contrary, subsist, and think, and act, in a separate state, it does not therefore necessarily follow that it *will* do so; and every thing that we know of its nature and its energies leads us to think, that without some kind of body by which to act as by an instrument, all its powers would continue dormant. There is not the shadow of a reason to suppose that it existed and was conscious in a prior state; and as its memory at present unquestionably depends upon the state of the brain, there is all the evidence of which the case will admit, that if it should subsist in a future state divested of all body, though it might be endowed with new and enlarged powers of *perception*, it could have no *recollection* of what it did and suffered in *this world*, and therefore would not be a fit object either of reward or of punishment. This consideration has compelled many thinking men, both Pagans and Christians, to suppose that at death the soul carries with it a fine material vehicle, which is its immediate sensorium in this world, and continues to be the seat of its recollection in the next. Such, we have seen, was the opinion of Mr Wollaston and Dr Hartley; it was likewise the opinion of Cudworth and Locke, who held that the supreme Being alone is the only mind wholly separated from matter; and it is an opinion which even Dr Clarke, one of the ablest advocates for immaterialism, would not venture positively to deny.

250 Ancient.

Nor is this opinion peculiar to a few moderns. Cudworth, after giving a vast number of quotations from Pythagoreans and Platonists, which prove to a demonstration that they held the Deity to be the only mind which perceives and acts without the instrumentality of matter, observes, that "from what hath been said, it appeareth, that the most ancient assertors of the incorporeity and immortality of the human soul, yet supposed it to be always conjoined with some body. Thus *Hierocles* plainly ἡ λογικη ουσια συμφυες εχουσα σωμα, ουτω παρα του δημιουργου εις το ειναι παρηλθεν, ως μητε το σωμα ειναι αυτην, μητε ανευ σωματος· αλλ αυτην μεν ασωματον, αποτερα τουσθαι δε εις σωμα το ὁλον αυτης ειδος. *The rational nature having always a kindred body, so proceeded from the demiurgus, as that neither itself is body, nor yet can it be without body; but though itself be incorporeal, yet its whole form is terminated in a body.* Agreeably to this the definition which he gives of a man is, ψυχη λογικη μετα συμφους αθανατου σωματος, *a rational soul, together with a kindred immortal body*; and he affirms, that our present animated terrestrial body, or mortal man, is nothing but ειδωλον ανθρωπου, *the image of the true man*, or an accession from which it may be separated. Neither does he affirm this only of human souls, but also of all other rational beings whatsoever below the supreme Deity, that they always naturally actuate some body. Wherefore a demon or angel (which by *Hierocles* are used as synonymous words), is also defined by him after the same manner, ψυχη λογικη μετα φωτεινου σωματος *a rational soul, together with a lucid body*. And accordingly *Proclus* upon *Plato's Timæus affirmeth*, παντα δαιμονα των ἡμετερων κρειττονα ψυχων, και νοεραν εχειν, ψυχην, και οχημα αιθεριον: *That every demon, superior to human souls, hath both an intellectual soul and an ætherial vehicle, the entireness thereof being made up or compounded of these two things.* So that there is hardly any other difference left between demons or angels, and men, according to these philosophers, but only this, that the former are lapsable into aerial bodies only, and no further; but the latter into terrestrial also. Now, *Hierocles* positively affirms this to have been the true cabala, and genuine doctrine of the ancient Pythagoreans, entertained afterwards by Plato: και τουτο των Πυθαγορειων ην δογμα, ὁ δε Πλατων υστερον εξεφηνεν, απεικασας ξυμφυτω δυναμει υποπτερου ξευγους τε και ἡνιοχου; πασαν θειαν τε και ανθρωπινην ψυχην. *And this was the doctrine of the Pythagoreans, which Plato afterwards declared; he resembling every both human and divine soul* (i. e. in our modern language, every created rational being) *to a winged chariot, and a driver or charioteer both together*: meaning by the chariot, an animated body; and by the charioteer, the incorporeal soul actuating it.

That this Pythagorean opinion of the Deity's being the only mind which thinks and acts without material organs was very generally received by the ancient Christians, might be proved by a thousand quotations: We shall content ourselves with producing two from the learned *Origen*. "Solius Dei (saith this philosophic father of the church), id est, Patris, Filii, et Spiritus Sancti, naturæ id proprium est, ut sine materiali substantia, et absque ulla corporeæ adjectionis societate, intelligatur subsistere †." "Materialem substantiam opinione quidem et intellectu solum separari, a naturis rationalibus, et pro ipsis, vel post ipsis affectam videri; sed nunquam sine ipsa eas vel vixisse, vel vivere: Solius namque Trinitatis incorporea vita existere putabitur ‡." Should Mr Cooper and his friends ask, What is the use of a soul which cannot act without the instrumentality of matter? or why we should suppose the existence of such a substance? we beg leave, in our turn, to ask these gentlemen, What is the use of a brain which cannot see without eyes?

† Peri Archon, lib. ii. cap. 6.

‡ Lib. cap. 2.

5 and

and why they ſhould ſuppoſe all our ſenſations to terminate in ſuch an internal ſyſtem, ſince the vulgar certainly ſuppoſe their ſenſations to ſubſiſt in their reſpective organs? How this ancient notion, which makes body ſo eſſential a part of man, is conſiſtent with the immortality of the human ſoul, we ſhall inquire in a ſubſequent chapter; in which we ſhall endeavour to aſcertain what kind of immortality we have reaſon to expect, and upon what evidence our expectation muſt reſt. Previous to this inquiry, however, it is neceſſary to enter upon another, which is of the firſt importance, and which every materialiſt has endeavoured to perplex; we mean that which concerns *perſonal identity*: for if, as has been often ſaid, no man is the ſame perſon two days ſucceſſively, it is of no importance to us whether the ſoul be mortal or immortal.

Chap. III. *Of* Personal Identity.

Whether we are to live in a future ſtate, as it is the moſt important queſtion which can poſſibly be aſked, ſo is it the moſt intelligible one which can be expreſſed in language. Yet ſtrange perplexities have been raiſed about the meaning of that identity or ſameneſs of perſon, which is implied in the notion of our living now and hereafter, or indeed in any two ſucceſſive moments; and the ſolution of theſe difficulties hath been ſtranger than the difficulties themſelves. To repeat all that has been ſaid on the ſubject would ſwell this chapter to a diſproportionate bulk. We ſhall therefore content ourſelves with laying before our readers the ſentiments of Biſhop Butler, and the fancies and demonſtrations of the philoſopher of Mancheſter. We are induced to adopt this courſe, becauſe we think the illuſtrious Biſhop of Durham has exhauſted the ſubject, by ſtating fairly the opinions which he controverts, and by eſtabliſhing his own upon a foundation which cannot be ſhaken, and which are certainly not injured, by the objections of Mr Cooper.

"When it is aſked (ſays this philoſophical prelate†) in what perſonal identity conſiſts? the anſwer ſhould be the ſame as if it were aſked in what conſiſts ſimilitude or equality?—that all attempts to define would but perplex it. Yet there is no difficulty at all in aſcertaining the idea or notion: For as, upon two triangles being compared or viewed together, there ariſes to the mind the notion of ſimilitude; or, upon twice two and four, the notion of equality: ſo likewiſe, upon comparing the conſciouſneſs of one's ſelf or one's own exiſtence in any two moments, there as immediately ariſes to the mind the notion of perſonal identity. And as the two former compariſons not only give us the notions of ſimilitude and equality, but alſo ſhow us that two triangles are ſimilar, and that twice two and four are equal; ſo the latter compariſon not only gives us the notion of perſonal identity, but alſo ſhows us the identity of ourſelves in theſe two moments—the preſent, ſuppoſe, and that immediately paſt, or the preſent and that a month, a year, or twenty years paſt. In other words, by reflecting upon that which is myſelf now, and that which was myſelf twenty years ago, I diſcern they are not two, but one and the ſame ſelf.

"But though conſciouſneſs of what is preſent and remembrance of what is paſt do thus aſcertain our perſonal identity to ourſelves; yet, to ſay that remembrance makes perſonal identity, or is neceſſary to our being the ſame perſons, is to ſay that a perſon has not exiſted a ſingle moment, nor done one action, but what he can remember; indeed none but what he reflects upon. And one ſhould really think it ſelf-evident, that conſciouſneſs of perſonal identity preſuppoſes and therefore cannot conſtitute perſonal identity; any more than knowledge, in any other caſe, can conſtitute truth, which it preſuppoſes.

253 Theſe, however, do not make perſonal identity.

"The inquiry, what makes vegetables the ſame in the common acceptation of the word, does not appear to have any relation to this of perſonal identity; becauſe the word *ſame*, when applied to them and to perſon, is not only applied to different ſubjects, but is alſo uſed in different ſenſes. When a man ſwears to the ſame tree, as having ſtood fifty years in the ſame place, he means only the ſame as to all the purpoſes of property and uſes of common life, and not that the tree has been all that time the ſame in the ſtrict philoſophical ſenſe of the word: For he does not know whether any one particle of the preſent tree be the ſame with any one particle of the tree which ſtood in the ſame place fifty years ago. And if they have not one common particle of matter, they cannot be the ſame tree in the proper and philoſophic ſenſe of the word *ſame*; it being evidently a contradiction in terms to ſay they are, when no part of their ſubſtance and no one of their properties is the ſame; no part of their ſubſtance, by the ſuppoſition; no one of their properties, becauſe it is allowed that the ſame property cannot be transferred from one ſubſtance to another: And therefore, when we ſay that the identity or ſameneſs of a plant conſiſts in a continuation of the ſame life, communicated under the ſame organization to a number of particles of matter, whether the ſame or not; the word *ſame*, when applied to life and to organiſation, cannot poſſibly be underſtood to ſignify what it ſignifies in this very ſentence, when applied to matter. In a looſe and popular ſenſe, then, the life, and the organiſation, and the plant, are juſtly ſaid to be the ſame, notwithſtanding the perpetual change of the parts. But, in a ſtrict and philoſophical manner of ſpeech, no man, no being, no mode of being, no any thing, can be the ſame with that with which it has indeed nothing the ſame. Now ſameneſs is uſed in this latter ſenſe when applied to perſons. The identity of theſe, therefore, cannot ſubſiſt with diverſity of ſubſtance.

254 What it is.

"The thing here conſidered, and demonſtratively, as I think, determined, is propoſed by Mr Locke in theſe words: *Whether it* (i. e. the ſame ſelf or perſon) *be the ſame identical ſubſtance?* And he has ſuggeſted what is a much better anſwer to the queſtion than that which he gives it in form: For he defines perſon *a thinking intelligent being*, &c. and perſonal identity, *the ſameneſs of a rational being*; and then the queſtion is, Whether the ſame rational being is the ſame ſubſtance? which needs no anſwer; becauſe being and ſubſtance are in this place ſynonymous terms. The ground of the doubt, whether the ſame perſon be the ſame ſubſtance, is ſaid to be this, that the conſciouſneſs of our own exiſtence, in youth and in old age, or in any two joint ſucceſſive moments, is not *the ſame individual action*,

i. e.

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i. e. not the fame confcioufnefs, but different fucceffive confcioufneffes. Now it is ftrange that this fhould have occafioned fuch perplexities: for it is furely conceivable, that a perfon may have a capacity of knowing fome object or other to be the fame now which it was when he contemplated it formerly; yet in this cafe, where, by the fuppofition, the object is perceived to be the fame, the perception of it in any two moments cannot be one and the fame perception. And thus, though the fucceffive confcioufneffes which we have of our own exiftence are not the fame, yet are they confcioufneffes of one and the fame thing or object; of the fame perfon, felf, or living agent. The perfon of whofe exiftence the confcioufnefs is felt now, and was felt an hour or a year ago, is difcerned to be, not two perfons, but one and the fame perfon; and therefore is one and the fame.

255 False notions of perfonal identity

"Mr Locke's obfervations upon this fubject appear hafty; and he feems to profefs himfelf diffatisfied with fuppofitions which he has made relating to it. But fome of thofe hafty obfervations have been carried to a ftrange length by others; whofe notion, when traced and examined to the bottom, amounts, I think, to this: 'That perfonality is not a permanent but a tranfient thing: That it lives and dies, begins and ends, continually: That no one can any more remain one and the fame perfon two moments together, than two fucceffive moments can be one and the fame moment: That our fubftance is indeed continually changing: but whether this be fo or not is, it feems, nothing to the purpofe; fince it is not fubftance, but confcioufnefs alone, which conftitutes perfonality; which confcioufnefs, being fucceffive, cannot be the fame in any two moments, nor confequently the perfonality conftituted by it §.'" Hence it muft follow, that it is a fallacy upon ourfelves to charge our prefent felves with any thing we did, or to imagine our prefent felves interefted in any thing which befel us, yefterday; or that our prefent felf will be interefted in what will befal us to-morrow; fince our prefent felf is not in reality the fame with the felf of yefterday, but another felf or perfon coming in its room, and miftaken for it; to which another felf will fucceed to-morrow. This, I fay, muft follow: for if the felf or perfon of to day and that of to-morrow are not the fame, but only like perfons; the perfon of to-day is really no more interefted in what will befal the perfon of to-morrow, than in what will befal any other perfon. It may be thought, perhaps, that this is not a juft reprefentation of the opinion we are fpeaking of; becaufe thofe who maintain it allow that a perfon is the fame as far back as his remembrance reaches: And indeed they do ufe the words *identity* and *fame* perfon; nor will language permit thefe words to be laid afide. But they cannot, confiftently with themfelves, mean that the perfon is really the fame: For it is felf-evident, that the perfonality cannot be really the fame, if, as they exprefsly affert, that in which it confifts is not the fame. And as, confiftently with themfelves, they cannot, fo I think it appears they do not, mean that the perfon is *really* the fame, but only that he is fo in a fictitious fenfe, in fuch a fenfe only as they affert: for this they do affert, that any number of perfons whatever may be the fame perfon. The bare unfolding this notion, and laying it thus naked and open,

§ *Anfwer to Dr Clarke's third Defence of his Letter to Mr Dodwell*, fecond edit. p. 44, 56, &c.

feems the beft confutation of it. However, fince great ftrefs is faid to be put upon it, I add the following things:

256 Overthrow

"*Firft*, This notion is abfolutely contradictory to that certain conviction, which neceffarily and every moment rifes within us, when we turn our thoughts upon ourfelves, when we reflect upon what is paft, and look forward to what is to come. All imagination, of a daily change of that living agent which each man calls himfelf for another, or of any fuch change throughout our whole prefent life, is entirely borne down by our natural fenfe of things. Nor is it poffible for a perfon in his wits to alter his conduct with regard to his health or affairs, from a fufpicion that though he fhould live to-morrow he fhould not however be the fame perfon he is to day.

"*Secondly*, It is not an *idea*, or abftract *notion*, or quality, but a being only which is capable of life and action, of happinefs and mifery. Now all beings confeffedly continue the fame during the whole time of their exiftence. Confider then a living being now exifting, and which has exifted for any time alive: this living being muft have done, and fuffered, and enjoyed, what it has done, and fuffered, and enjoyed, formerly (this living being, I fay, and not another), as really as it does, and fuffers, and enjoys, what it does, and fuffers, and enjoys, this inftant. All thefe fucceffive actions, fufferings, and enjoyments, are actions, enjoyments, and fufferings, of the fame living being; and they are fo prior to all confiderations of its remembering or forgetting, fince remembering or forgetting can make no alteration in the truth of paft matter of fact. And fuppofe this being endued with limited powers of knowledge and memory, there is no more difficulty in conceiving it to have a power of knowing itfelf to be the fame being which it was fome time ago, of remembering fome of its actions, fufferings, and enjoyments, and forgetting others, than in conceiving it to know, or remember, or forget, any thing elfe.

"*Thirdly*, Every perfon is confcious that he is now the fame perfon or felf he was as far back as his remembrance reaches: fince when any one reflects upon a paft action of his own, he is juft as certain of the perfon who did that action, namely himfelf (the perfon who now reflects upon it), as he is certain that the action was at all done. Nay, very often a perfon's affurance of an action having been done, of which he is abfolutely affured, arifes wholly from the confcioufnefs that he himfelf did it: and this he, perfon, or felf, muft either be a fubftance or the property of fome fubftance. If *he*, if perfon, be a fubftance; then confcioufnefs that he is the fame perfon, is confcioufnefs that he is the fame fubftance. If the perfon, or *he*, be the property of a fubftance, ftill confcioufnefs that he is the fame property is as certain a proof that his fubftance remains the fame, as confcioufnefs that he remains the fame fubftance would be; fince the fame property cannot be transferred from one fubftance to another.

"But though we are thus certain that we are the fame agents, living beings, or fubftances, now, which we were as far back as our remembrance reaches; yet it is afked, Whether we may not poffibly be deceived in it? And this queftion may be afked at the end of any demonftration whatever; becaufe it is a queftion con-

concerning the truth of perception by memory: and he who can doubt whether perception by memory can in this case be depended upon, may doubt also whether perception by deduction and reasoning, which also include memory, or indeed whether intuitive perception itself, can be depended upon. Here then we can go no farther: for it is ridiculous to attempt to prove the truth of our faculties, which can no otherwise be proved than by the use or means of those suspected faculties themselves."

7 [Objections fore-stalled &c.]

This reasoning, which we believe will to most men appear unanswerable, Mr Cooper hopes to overturn by the following observations*: "If all imagination of a daily change in us be borne down by our natural sense of things, then (says he) does our natural sense of things positively contradict known fact; for a daily, a momentaneous, change in us, *i. e.* in our bodies, does actually take place." True, a daily change in our bodies does take place, and so likewise does a daily change in our cloaths; but surely no man was ever led by his natural sense of things to suppose, that his limbs or external organs were the seats of sensation and will, any more than that his coat or his shoes were any real parts of his trunk or of his feet. But it is only that which thinks and wills that any man considers, in this case, as himself or his person; and if our natural sense of things, or consciousness, tell us, that what thinks and wills has continued the same from a distance of time as far back as we can remember, it is certain, that, whether it be material or immaterial, it has continued from that period, otherwise we can be certain of nothing. "But (says our philosopher) other known and ascertained facts are frequently borne down by our natural sense of things: for how many thousand years before the days of *Copernicus* was the motion of the earth round the sun entirely borne down by our natural sense of things, which made us give full credit to the motion of the sun round the earth? Do not the generality of mankind believe, upon the evidence of their natural sense of things, that every part of their body remains exactly the same today as it was yesterday?"

8 [...ered.]

To the former of these questions we answer positively, that before the days of *Copernicus* the motion of the earth round the sun was *not* borne down by our *natural sense* of things, but by ill-founded hypotheses and inconclusive reasonings. By the natural sense of things, nothing can be meant, in this place, but the evidence of consciousness or of external sensation; but the *actual motion* either of the sun or of the earth is not perceived either by consciousness or by sensation. Of consciousness nothing is the object but the internal energies and feelings of our own minds; and with regard to the motion of the sun or of the earth, nothing is perceived by the sense of sight but that, after considerable intervals of time, these two great bodies have repeatedly changed their places in the heavens with respect to each other. This is all that on this subject our *natural sense of things* leads us to believe; and is not this infallibly true? Afterwards indeed, by taking for granted the truth of propositions, for which neither sense nor consciousness affords the shadow of evidence; the vulgar now, and all mankind formerly, reasoned themselves into the opinion, that the earth stands still, and that the sun moves round it. In vulgar philosophy it is taken for granted, that in the universe there is not a *relative* but an *absolute upwards* and an *absolute downwards*; that our heads are absolutely upward, and our feet downward; and that were the earth to revolve round its axis, these positions would be reversed, that our heads would be placed beneath our feet, and that we ourselves would fall from the earth into empty space. Upon these false hypotheses the vulgar reason correctly. They know that bodies cannot change their place without motion; they know that in the time of their remembrance the sun and the earth have been perpetually varying their places with respect to each other; they know that they themselves have never fallen, nor had a tendency to fall, into empty space; and hence they infer that it is the sun and not the earth that moves (K). But will any man say that the absurd suppositions from which this conclusion is logically deduced, have the evidence either of sensation or of consciousness, as the permanency of that living agent which each man calls himself has?

To our author's second question we likewise reply with confidence, that the generality of mankind do *not* believe, upon their natural sense of things, that every part of their body remains exactly the same to-day as it was yesterday. It would be strange indeed if they did, after having repeatedly experienced the waste of increased perspiration or sweating; after having witnessed men emaciated by sickness, and again restored to plumpness in health; and after having perhaps lost whole limbs, which certainly their natural sense of things teaches them to consider as parts of their body. In all these cases, the generality of mankind are as sensible of changes having taken place in their bodies as he who has attended ever so closely to physiological inquiries, though not one of them has the least imagination of a change having taken place in the living agent which each man calls himself.

Bishop Butler observes, that if the living agent be perpetually changing, it is a fallacy upon ourselves to charge our present selves with any thing we did, to imagine our present selves interested in any thing which befel us yesterday, or that our present self will be interested in what will befal us to-morrow. To this judicious observation our daring philosopher replies, "that as the man of to-morrow, though not in all points the same with, yet depends for his existence upon, the man of to-day, there is sufficient reason to care about him." Could he have said, that as the man of to-day depends for his existence on the man of to-morrow, there is sufficient reason for the present man to care about the future man; or that as the man of to-morrow depends for his existence on the man of to-day,

(K) This inference too has been so often drawn, that it comes in time to coalesce in the mind with the *sensations*, from which the motion either of the sun or of the earth is deduced with infallible certainty; and hence it is considered as part of that truth which sensation immediately discovers. *See our Chapter of Association.*

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day, there is to-day fufficient reafon for the future man to care about the prefent man; we fhould in either cafe, if the anachronifm had been kept out of fight, have feen the force of his argument. Every man has fufficient reafon to care about the ox upon which he is to be fed; but we cannot fo clearly perceive what reafon the ox has to care about the man.

Not fatisfied, it would feem, with this reply, our author proceeds to affirm, "that the man of to-morrow, poffeffing a reminifcence of the actions of the man of to-day, and knowing that thefe actions will be referred to him both by himfelf and others (which is certainly knowing that both himfelf and others are moft iniquitous wretches), they cannot be indifferent to the man of to-day, who looks forward to the properties of the man of to-morrow," *i. e.* the reminifcence and knowledge of a future man conftitute all the relation that fubfifts between a prefent man and his actions; a difcovery worthy of an original genius. But as on the fubject of perfonal identity we pretend to no originality, we fhall leave this propofition to the meditation of our readers, and take the liberty to afk our author a queftion or two refpecting this fame reminifcence, which he is gracioufly pleafed to acknowledge for a property.

He defines identity, "the continued exiftence of any being unaltered in fubftance or in properties;" and he repeatedly acknowledges that no identical quality or property can be transferred from one fubject to another. Let us now fuppofe, that a man has a reminifcence of an individual action performed a month ago, and that this reminifcence is accompanied with a confcioufnefs that the action was performed by himfelf. This fuppofition, whether true or falfe, may certainly be made; for it implies nothing more than what every man firmly believes of himfelf in every act of remembrance. Let us again fuppofe, that, at the diftance of ten or twenty years, the man known by the fame name has a reminifcence of the fame action, with a confcioufnefs that he himfelf performed it. Is this reminifcence the fame with the former? or is it a different reminifcence? If it be the fame, either the perfon remembering at the diftance of ten or twenty years is the fame with him who remembered at the diftance of a month, or there is an identical quality transferred from one fubftance to another, which is admitted to be impoffible. If reminifcence be itfelf a real and immediate quality of any fubftance, and not the mere energy of a power, and if the one reminifcence be different from the other, the fubjects in which thefe two different qualities inhere muft likewife be different. Yet the man who has the reminifcence at the diftance of a month, has the evidence of confcioufnefs that the action was performed by him; and the man who has the reminifcence at the diftance of ten or twenty years, has likewife the evidence of confcioufnefs that the fame action was performed by him and not by another. By the confeffion of Hume and of all philofophers, confcioufnefs never deceives; but here is the evidence of one confcioufnefs in direct oppofition to another; and therefore, as two contradictory propofitions cannot both be true, either the one reminifcence is the fame with the other, or reminifcence is no real quality. That one act of reminifcence fhould be numerically the fame with another, which followed it at the diftance of twenty years, is plainly impoffible; whence it fhould feem, that reminifcence itfelf is no real and immediate quality of any fubftance. But if this be fo, what is reminifcence? We anfwer, it is plainly neither more nor lefs than the *energy* of a power, which though dormant between its energies, remains unchanged from the one to the other, and which being itfelf the real and immediate quality of a fubject, that fubject muft likewife remain unchanged. That powers may remain dormant, and yet unchanged, every man muft be convinced; who having ftruck any thing with his hand, knows that he has power to repeat the ftroke, and yet does not actually repeat it. Two blows with the hand immediately following each other are numerically different, fo that the one cannot with truth be faid to be the other; but we have the evidence of external fenfe, that they are both ftruck by the fame member. In like manner, two energies of reminifcence directed to the fame object, and fucceeding each other at any interval of time, cannot poffibly be one and the fame energy; but as the latter energy may include in it the former as well as the object remembered by both, we have the evidence of confcioufnefs that both are energies of the fame power; and we have feen, that to fuppofe them any thing elfe, may be demonftrated to involve the groffeft abfurdities and contradictions.

Mr Cooper has other arguments to obviate the force of Bifhop Butler's demonftration of perfonal identity; fuch as, that a "high degree of *fimilarity* between the two fucceeding men is fufficient to make the one care about the other;" and, that "a good man, knowing that a future being will be punifhed or rewarded as the actions of the prefent man deferve, will have a fufficient motive to do right and to abftain from wrong." But if there be any one of our readers who can fuffer himfelf to be perfuaded by fuch affertions as thefe, that the living agent which he calls himfelf is perpetually changing, and at the fame time that fuch change is confiftent with the expectation of future rewards and punifhments, he would not be reclaimed from his error by any reafoning of ours. We fhall therefore truft fuch trifling with every man's judgment, and proceed to examine our author's *demonftration*, that perfonal identity has no exiftence. But here it is no part of our purpofe to accompany him through his long chemical ramble, or to controvert his arguments for the non-identity of vegetable and animal bodies. The only thing to which, after Bifhop Butler, we have afcribed identity, is that which in man is fentient and confcious; and the non-identity of this thing, whatever it be, Mr Cooper undertakes to demonftrate from the known properties of fenfations and ideas.

25
A pretended demonftration that perfonal identity is impoffible.

This demonftration fets out with a very ominous circumftance. The author, after conducting impreffions *ab extra*, from the extremities of the nerves to the brain, affirms, that *fenfations* and *ideas* are nothing but "motions in the brain perceived;" *i. e.* when a man thinks he is looking at a mountain, not only at reft, but to appearance immoveable, he is grofsly deceived; for he perceives nothing all the while but *motion in his brain!* Were not the defire of advancing novelties and paradoxes invincible in fome minds, we fhould be aftonifhed at finding fuch an affertion as this

this fall from the pen of any man who had paid the slightest attention to the different energies of his own intellect. Motions in the brain, as we have repeatedly observed, are the immediate causes of our sensations; but is it conceivable, is it possible, that any thing should be the cause of itself? The motion of a sword through the heart of a man, is the immediate cause of that man's death; but is the sword or its motion *death* itself, or can they be conceived as being the *sensations* of the *man* in the *agonies* of *dying?* But sensations and ideas, whatever they be, exist in succession; and therefore, argues our demonstrator, no two sensations or ideas can be one and the same sensation or idea. The conclusion is logically inferred; but what purpose can it possibly serve? What purpose, why it seems "sensations and ideas are the only *existences whose existence* we certainly know (a charming phrase, the *existence* of *existences*, and as original as the theory in which it makes its appearance); and, therefore, from the nature of sensations and ideas, there is no such thing as permanent identity." Indeed! what then, we may be permitted to ask, is the import of the word *we* in this sentence? Does it denote a series of sensations and ideas, and does each sensation and each idea certainly know not only itself, but all its ancestors and all its descendants? Unless this be admitted, we are afraid that some other existence besides sensations and ideas must be allowed to be certainly known, and even to have something of a permanent identity. Nay, we think it has been already demonstrated (see chap. of Time), that were there not something permanent, there could be no time, and of course no notion of a first and last, or indeed of succession, whether of sensations or ideas. And therefore, if we have such a notion, which the author here takes for granted, and upon which indeed his demonstration rests, it follows undeniably that there is something permanent, and that we *know* there is something permanent, which observes the succession of sensations and ideas.

All this, indeed, Mr Cooper in effect grants; for he is not much startled at the appearance of contradictions in his theory. "I find (says he), by perpetually repeated impressions which I perceive, that my hands, body, limbs, &c. are connected, are parts of one whole. I find, by perpetually repeated perceptions also, that the sensations excited by them are constantly similar, and constantly different from the sensations excited by others." He has then repeated perceptions: but how can this be possible, if *he* be not different from the perceptions, and if *he* do not *remain unchanged* while the perceptions succeed each other at greater or less intervals of time? A striking object passing with rapidity before the eyes of a number of men placed beside each other in a line of battle, would undoubtedly excite a succession of sensations; but surely that succession would not take place in the mind of *any individual* in the line, nor could any *single man* in this case say with truth that he had *repeated* perceptions of the object. In like manner, were that which is sentient perpetually changing, no man could possibly say or suppose that he had repeated perceptions of any thing; for upon this supposition, the man of to-day would have no more connection with the man who bore his name yesterday, or twenty years ago, than the last man in the line had with the first.

Upon the whole, we cannot help thinking, that Bishop Butler's demonstration of personal identity remains unshaken by the batteries of Mr Cooper.—It rests, indeed, upon the solid basis of consciousness and memory; and if implicit credit be not given to the evidence of these faculties, we cannot proceed a single step in any inquiry whatever, nor be certain of the truth even of a mathematical demonstration.

261 A difficulty removed.

But as we have ourselves supposed, that to sensation, reminiscence, and every actual energy of the mind of man, the instrumentality of some material system is necessary, it may perhaps be thought incumbent on us to show how the perpetual flux of the particles of matter which compose the brain, as well as all the other parts of the body, can consist with the identity of the person who perceives, remembers, and is conscious. If this cannot be done, our hypothesis, ancient and plausible as it is, must be given up; for of personal identity it is impossible to doubt. In this case, however, we perceive no difficulty; for if there be united to the brain an immaterial being, which is the subject of sensation, consciousness, and will, &c. it is obvious, that all the *intellectual powers* which properly constitute the person, must be inherent in that being. The material system, therefore, can be necessary only as an instrument to excite the energies of those powers; and since the powers themselves remain unchanged, why should we suppose that their energies may not be continually exerted by successive instruments of the same kind, as well as by one permanent instrument? The powers of perception and volition are not, in the material system, any more than the sensation of seeing is in the rays of light, or the energy of the blacksmith in the hammer with which he beats the anvil. Let us suppose a man to keep his eye for an hour steadily fixed upon one object. It will not surely be denied, that if this could be done, he would have one uninterrupted and unvaried perception of an hour's duration, as measured by the clock. Yet it is certain, that the rays of light which alone could occasion that perception would be perpetually changing. In like manner, a blacksmith, whilst he continues to beat his anvil, continues to exert the same power whether he uses one hammer all the time, or a different hammer at each stroke. The reason is obvious; the eye, with all its connections of brain and mind in the one case, and the person of the smith in the other, remain unchanged; and in them alone reside the faculty of sensation and the power of beating, though neither the faculty nor the power can be exerted without material instruments. But were it possible that millions of men could in the space of an hour take their turns in rotation with each new ray of light, it is self-evident, that in this case, there would be nothing permanent in sensation; and, therefore, there could not be one uninterrupted and unvaried perception, but millions of perceptions, during the hour, totally distinct from and unconnected with each other. Let us now suppose a man to fix his eye upon an object for the space of a minute, and at the distance of a day or a month to fix it upon the same object

object a second time: He would not indeed, in this case, have one uninterrupted and unvaried perception, but he would be conscious of the energy of the very same faculty the second time as at the first. Whereas, were one man to view an object to-day, and another to view the same object to-morrow, it is obvious, that he who should be last in the succession could know nothing of the energy of that faculty by which the object was perceived the first day, because there would be nothing common to the two perceptions.

Thus then we see, that *personal identity* may with truth be predicated of a compound being, though the material part be in a perpetual flux, provided the immaterial part remain unchanged; and that of such a being only is a resurrection from the dead possible.—For since the motions of the brain do nothing more than excite to energy the permanent powers of the mind, it is of no sort of consequence to that energy, whether these motions be continued by the same numerical atoms, or by a perpetual succession of atoms arranged and combined in the very same manner. We shall, therefore, be the same persons at the resurrection as at present, whether the mind be united to a particular system composed of any of the numberless atoms which have in succession made parts of our present bodies, or to a system composed of totally different atoms, provided that new system be organised in exactly the same manner with the brain or material vehicle, which is at present the immediate instrument of perception. This (we say) is self-evident; but were the immaterial part to change with the changing body, a resurrection of the same persons would be plainly impossible.

Chap. IV. *Of the* Immortality *of the* Soul.

262 The immortality of the soul the general belief in all nations.

Wherever men have been in any degree civilized, and in some nations where they have been in the most savage state, it has been the general persuasion, that the mind or soul subsists after the dissolution of the body. The origin of this persuasion, about which disputes have been raised, no Christian hesitates to attribute to revelation. The Egyptians, from whom the Greeks derived many of their theological and philosophical principles, appear to have taught the immortality of the soul, not as a truth discovered by the exertions of human reason, but as a dogma derived to them from the earliest ages by tradition. This indeed may be confidently inferred from the character and conduct of their first Greek disciples. Those early wise men who fetched their philosophy immediately from Egypt, brought it home as they found it, in detached and independent placits. Afterwards, when schools were formed, and when man began to philosophise by hypothesis and system, it was eagerly inquired upon what foundation in *nature* the belief of the soul's immortality could rest; and this inquiry gave rise to the various disquisitions concerning the *substance* of the soul, which have continued to exercise the ingenuity of the learned to the present day. It was clearly perceived, that if consciousness, thought, and volition, be the result of any particular modification of matter and motion, the living and thinking agent must perish with the dissolution of the system; and it was no less evident, that if the being which perceives, thinks, and wills, be not material, the mind of man *may* subsist after the resolution of the body into its component particles. The discovery of the immateriality of the mind was therefore one *step towards* the proof of its immortality; and in the opinion of many philosophers, whose hopes ought to rest on a surer basis, it was alone a complete proof.—"They who hold sensitive perception in brutes (says a pious writer †) to be an argument for the immateriality of their souls, find themselves under the necessity of allowing those souls to be immortal."

† See Proced. Extent and Limits of Understanding.

26 The philosophers of ancient Greece believed likewise in pre-existence.

The philosophers of ancient Greece, however, felt not themselves under any such necessity. Whatever were their opinions respecting the souls of brutes, they clearly perceived that nothing which had a beginning of existence could be naturally immortal, whether its substance were material or immaterial.—"There never was any of the ancients before Christianity (says the accurate Cudworth), that held the soul's future permanency after death, who did not likewise assert its pre-existence; they clearly perceiving, that if it were once granted that the soul was generated, it could never be proved but that it might be also corrupted. And, therefore, the assertors of the soul's immortality commonly began here, first to prove its pre-existence, proceeding thence to establish its permanency after death. This is the method of proof used in Plato: Ην που ἡμων ἡ ψυχη πριν εν τῳδε τῳ ανθρωπινῳ ειδει γενεσθαι, ὡστε και ταυτῃ αθανατον τι εοικεν ἡ ψυχη ειναι. *Our soul was somewhere before it came to exist in this human form, and thence it appears to be immortal, and as such will subsist after death.*"

26 And also in its eternity.

To give this argument for immortality any strength, it must be taken for granted, not only that the soul existed in a *prior* state, but that it existed from all *eternity*; for it is obvious, that if it had a beginning in any state, it may have an end either in that state or in another. Accordingly, Plato asserts in plain terms its eternity and self-existence, which, as we learn from Cicero, he infers from its being the principle of motion in man. "Quin etiam cæteris, quæ moventur, hic fons, hoc principium est movendi. *Principii autem nulla est origo.* Nam ex principio oriuntur omnia: ipsum autem nulla ex re alia nasci potest: nec enim esset id principium, quod gigneretur aliunde §." This, it must be acknowledged, is very contemptible reasoning; but the opinion which it was intended to prove was held by all the philosophers. They were unanimous in maintaining the *substance* of the soul, though not its *personality*, to be eternal *à parte ante* as well as *ad partem post*; and Cicero, where he tells us that this opinion passed from *Pherecydes, Syrus*, to Pythagoras, and from Pythagoras to *Plato*, expresses his notion of the soul's duration by the word *sempiternus* *, which, in its original and proper sense, is applicable only to that which has neither beginning nor end.

§ Tusc. lib. i. c. 23.

* Tusc. lib. i.

Indeed none of the philosophers of ancient Greece appear to have believed a creation (see Creation) possible: for it was a maxim universally received among them, *De nihilo nihil fit, in nihilum nil posse reverti*; that *nothing can come from nonentity, or go to nonentity.* This maxim, as held by the theistical philosophers, the learned Cudworth labours to interpret in a sense agreeable

able to our notions of the orgin of the world; but the quotations urged by himself must convince every competent reader that on this occasion he labours in vain. For instance, when Aristotle writes of Parmenides and Melissus, that ουδεν ουδε γινεσθαι φασιν ουδε φθειρεσθαι των οντων, *they say that no real entity is either made or destroyed*; what can be his meaning, but that those philosophers taught that nothing could be either created or annihilated? He testifies the same thing of *Xenophanes* and *Xeno*, when he says that it was a fundamental principle of their philosophy—μη ενδεχεσθαι γινεσθαι μηδεν εκ μη οντος—*that it is impossible that any thing should be made out of nothing*. And of Empedocles, when he relates απαντα ταυτα και εκεινος ὁμολογει ὁτι εκ τε μη οντος αμηχανον εστι γινεσθαι το τε ον εξολλυσθαι ανηνυστον και απρηκτον—*That he acknowledges the very same thing with other philosophers, viz that it is impossible that any thing should be made out of nothing, or perish into nothing*. But it is needless to multiply quotations respecting the opinions of single philosophers. Of all the physiologers before himself and Plato, Aristotle says, without exception, περι ταυτης ὁμογνωμονουσι της δοξης οἱ περι φυσεως, ὁτι το γιγνομενον εκ μη οντων γιγνεσθαι αδυνατον ‡—*That they agree in this opinion, that it is impossible that any thing should be made out of nothing*: and he calls this the common principle of naturalists; plainly intimating, that they considered it as the greatest absurdity to suppose that any real entity in nature could either be brought from nothing or reduced to nothing.

The author of the *Intellectual System*, in order, perhaps, to hide the impiety of this principle, endeavours to persuade his readers, that it was urged only against the hypothesis of forms and qualities of bodies considered as real entities, distinct from matter. But how it could be supposed to militate against that particular opinion, and not against the possibility of all creation, is to us perfectly inconceivable. The father of the school which analysed body into matter and form, together with by far the greater part of his followers, taught the eternity of both these principles (L); and therefore maintained, as strenuously as any atomist, the universal maxim, *De nihilo nihil fit*. Even Plato himself, whose doctrine of *ideas* is supposed to wear a more favourable aspect than Aristotle's *forms* to the truths of revealed religion, taught the *eternity* of *matter*; but whether as a self-existing substance, or only as an emanation from the Deity, is a question which has been disputed. That he admitted no proper creation, may be confidently inferred from Plutarch; who writing upon the generation of animals, according to the doctrine laid down in the *Timæus*, has the following passage: Βελτιον ουν, Πλατωνι πειθομενους τον μεν κοσμον υπο θεου γεγονεναι λεγειν και αδειν· ὁ μεν γαρ καλλιστος των γεγονοτων, ὁ δ' αριστος των αιτιων· την δε ΟΥΣΙΑΝ και ΥΛΗΝ εξ ἡς γεγονε, ου γενομενην, αλλα ὑποκειμενην αει τω δημιουργω εις διαθεσιν και ταξιν αυτης, και προς εξομοιωσιν, ὡς δυνατον ην, παρασχειν· ου γαρ εκ του μη οντος ἡ γενεσις, αλλ' εκ του μη καλως, μηδ' ἱκανως εχοντος, ὡς οικιας και ἱματιου, και ανδριαντος †. *It is therefore better for us to follow Plato, and to say and sing that the world was made by God. For as the world is the best of all works, so is God the best of all causes. Nevertheless, the* SUBSTANCE *or* MATTER *out of which the world was made, was* NOT *itself made, but was always ready at hand, and subject to the artificer, to be ordered and disposed by him. For the making of the world was not the production of it out of nothing, but out of an antecedent bad and disorderly state, like the making of a house, garment, or statue.*

Of the Immortality of the Soul.

† Plut. Op. tom. ii. p. 1014.

If, then, this be a fair representation of the sentiments of Plato, and surely the author understood those sentiments better than the most accomplished modern scholar can pretend to do, nothing is more evident, than that the founder of the academy admitted of no proper creation, but only taught that the matter which had existed from eternity in a chaotic state, was in *time* reduced to order by the *Demiurgus*, or supreme Being. And if such were the sentiments of the divine Plato, we cannot hesitate to adopt the opinion of the excellent Mosheim, which the reader will probably be pleased to have in his own words. "Si a Judæis discedas, nescio an ullus antiquorum philosophorum mundum negaverit æternum esse. Omnes mihi æternum professi videntur esse mundum: hoc uno vero disjunguntur, quod nonnulli, ut *Aristoteles, formam* et *materiam* simul hujus orbis, alii vero, quorum princeps facile Plato, *materiam* tantum *æternam*, formam vero, a Deo comparatam, dixerunt †."

† Notes on Cudworth's Intellectual System.

Now it is a fact so generally known, as not to stand in need of being proved by quotations, that there was not among them a single man who believed in the existence of mind as a being more excellent than matter, and essentially different from it, who did not hold the superior of at least equal antiquity with the inferior substance. So true is this, that Synesius, though a Christian, yet having been educated in one of the schools of philosophy, could not by the hopes of a bishopric be induced to dissemble this sentiment: αμελει την ψυχην ουκ αξιωσω ποτε σωματος ὑστερογενη νομιζειν *.—*I shall never be persuaded to think my soul younger than my body*. This man probably believed upon the authority of the scriptures, that the matter of the visible world was created in time; but he certainly held with his philosophic masters, that his own soul was as old as any atom of it, and that it had consequently existed in a prior state before it animated his present body.

* Epist. 105.

Those

(L) *Aristotelem*, et plerosque Peripateticorum, in vulgus notum est, in hac fuisse sententia—nec *natum* esse, nec *interiturum* unquam hunc mundum. Vid. *Petrus Gassendus Physic.* sect. i. lib. 1. cap. 6. *Jac. Thomasius de Stoica mundi exustione*, Diss. 4. et alii. Plures ita haud dubie senserunt philosophorum veterum. Hinc video *Manilium* in *Astronomico Lib.* i. inter philosophorum de mundo sententias hanc, ac si præcipua esset, primo commemorare loco:

Quem sive ex nullis repetentem semina rebus,
Natali quoque egere placet, semperque fuisse,
Et fore, principio pariter fatoque carentem.

Mosheim's edition of Cudworth's Intellectual System, lib. i. cap. 3. sect. 33. note 60. On this subject see also *Ancient Metaphysics*.

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Thoſe who maintained that the world was uncreated, maintained upon the ſame principle that their ſouls were uncreated likewiſe; and as they conceived all bodies to be formed of one firſt matter, ſo they conceived all ſouls to be either emanations from the one firſt Mind, or diſcerpted parts of it. Ariſtotle, who diſtinguiſhes between the intellectual and ſenſitive ſouls, ſays expreſsly of the former, that "it enters from without, and is DIVINE;" adding this reaſon for his opinion, that "its energy is not blended with that of the body—λειπεται δε τον νουν μονον θυραθεν επεισιεναι, και θειον ειναι μονον· ουδε γαρ αυτου τη ενεργεια κοινωνει σωματικη ενεργεια *. As to the Stoics, *Cleanthes* held (as Stobæus informs us †), that "every thing was made out of one, and would be again reſolved into one." But let Seneca ſpeak for them all: "Quid eſt autem, cur non exiſtimes in eo *divini* aliquid exiſtere, qui DEI PARS eſt? Totum hoc, quo continemur, et unum eſt, et Deus: et ſocii ejus ſumus, et membra||—*Why ſhould you not believe ſomething to be divine in him, who is indeed* PART OF GOD? *That* WHOLE *in which we are contained is* ONE, *and that one is* GOD; *we being his companions and* MEMBERS. Epictetus ſays, *The ſouls of men have the neareſt relation to God, as being* PARTS *or* FRAGMENTS *of him,* DISCERPTED *and* TORN *from his* SUBSTANCE: συναφεις τω θεω, ἅτε αυτου μορια ουσαι και αποσπασματα. Plato writes to the very ſame purpoſe, when, without any ſoftening, he frequently calls the ſoul *God*, and *part of God*. And Plutarch ſays, that "Pythagoras and Plato held the ſoul to be immortal; for that, launching out into the ſoul of the univerſe, it returns to its parent and original—Πυθαγορας, Πλατων, αφθαρτον ειναι την ψυχην· εξιουσαν γαρ εις την του παντος ψυχην, αναχωρειν προς το ομογενες †. Plutarch declares his own opinion to be, that "the ſoul is not ſo much the work and production of God, as a PART of him; nor is it made BY him, but FROM him, and OUT of him: ἡ δε ψυχη ουκ εργον εστι μονον, αλλα και μερος· ουδ' ΥΠ' αυτου, αλλ' ΑΠ' αυτου, και ΕΞ αυτου γεγονεν *. But it is needleſs to multiply quotations. Cicero delivers the common ſentiments of his Greek maſters on this head, when he ſays §, "A natura deorum, ut doctiſſimis ſapientiſſimiſque placuit, HAUSTOS animos et LIBATOS habemus." And again: "Humanus autem animus DECERPTUS EX MENTE DIVINA: cum alio nullo, niſi cum ipſo Deo (ſi hoc fas eſt dictu), comparari poteſt."

265 They ſuppoſed all ſouls to be emanations from the firſt mind;

* De Generatione Animalium, lib. ii. cap. 3.

† Eclog. Phyſ. c. 20.

|| Epiſt. 92.

† De Placitis Philoſophorum, lib iv. cap 7.

* Plato Quæſt

§ De Divinatione, lib. i cap. 49.

266 But differed in opinion as to the mode of their ſeparation.

Whilſt the philoſophers were thus unanimous in maintaining the ſoul to be a part of the ſelf-exiſtent Subſtance, they differed in opinion, or at leaſt expreſſed themſelves differently, as to the mode of its ſeparation from its divine parent. Cicero and the Stoics talk as if the Supreme Mind were extended, and as if the human ſoul were a part literally torn from that mind, as a limb can be torn from the body. The Pythagoreans and Platoniſts ſeem to have conſidered all ſouls as emanations from the divine Subſtance rather than as parts torn from it, much in the ſame way as rays of light are emanations from the ſun. Plato, in particular, believed in two ſelf-exiſtent principles, God and matter. The former he conſidered as the ſupreme Intelligence, incorporeal, without beginning, end, or change; and diſtinguiſhed it by the appellation of τo αγαθον, *the Good*. Matter, as ſubſiſting from eternity, he conſidered as without any one *form* or *quality* whatever, and as having a natural tendency to diſorder. Of this chaotic maſs God formed a perfect world, after the eternal pattern in his own mind, and endowed it with a ſoul or emanation from himſelf. In the language of Plato, therefore, the univerſe being animated by a ſoul which proceeds from God, is called the *ſon of God*; and ſeveral parts of nature, particularly the heavenly bodies, are *gods*. The human ſoul, according to him, is derived by emanation from God, through the intervention of this ſoul of the world; and receding farther from the firſt intelligence, it is inferior in perfection to the ſoul of the world, though even that ſoul is debaſed by ſome material admixture. To account more fully for the origin and preſent ſtate of human ſouls, Plato ſuppoſes *, that "when God formed the univerſe, he ſeparated from the ſoul of the world inferior ſouls, equal in number to the ſtars, and aſſigned to each its proper celeſtial abode; but that thoſe ſouls, (by what means, or for what reaſon, does not appear), were ſent down to the earth into human bodies, as into ſepulchres or priſons." He aſcribes to this cauſe the depravity and miſery to which human nature is liable; and maintains, that it "is only by diſengaging itſelf from all animal paſſions, and riſing above ſenſible objects, to the contemplation of the world of intelligence, that the ſoul of man can be prepared to return to its original ſtate." Not inconſiſtently with this doctrine, our philoſopher frequently ſpeaks of the ſoul of man as conſiſting of three parts: or rather he ſeems to have thought that man has three ſouls; the firſt the principle of intelligence, the ſecond of paſſion, and the third of appetite (M); and to each he aſſigns its proper place in the human body. But it was only the intellectual ſoul that he conſidered as immortal.

Ariſtotle

* En[...] Abri[...] of Bru[...] Hiſtor[...] Phil[...]

(M) "Plato tripliceem finxit animam; cujus principatum, id eſt, rationem, in capite, ſicut in arce, poſuit: et duas partes ſeparare voluit, iram et cupiditatem, quas locis diſcluſit; iram in pectore, cupiditatem ſubter precordia locavit." *Ciceronis Tuſc. Quæſt.* lib. i. cap. 10.

This hypotheſis has been adopted by the learned author of Ancient Metaphyſics: but it cannot be proved by argument, and is in direct oppoſition to conſciouſneſs. Were there three diſtinct minds in each man—the principles of intelligence, of paſſion, and of appetite, it is obvious that *each man* would be *three perſons*, and that *none* of theſe perſons could know any thing of the powers and properties of the *other two*. The intelligent perſon could not reaſon about *paſſion* or *appetite*; nor could the perſons who know nothing but paſſion and appetite reaſon about *intelligence*, or indeed about any thing elſe. The very queſtion at iſſue, therefore, furniſhes the moſt complete proof poſſible, that the ſame individual which each man calls himſelf, is the principle of intelligence, of paſſion, and of appetite: for if the Platonic hypotheſis were true, that queſtion could never have been ſtarted, as no one individual of the human race could have underſtood all its terms. It may be juſt worth while to mention, that the author of Ancient Metaphyſics, attributing all motion, Aristotle taught, in terms equally express, that the human soul is a part of God, and of course that its substance is of eternal and necessary existence. Some of his followers, indeed, although they acknowledged *two first principles*, the active and the passive, yet held, with the Stoics, but *one substance* in the universe; and to reconcile these two contradictory propositions, they were obliged to suppose matter to be both active and passive. Their doctrine on this subject is thus delivered by Cicero: "De natura ita dicebant, ut eam dividerent in res duas, ut altera esset efficiens, altera autem quasi huic se præbens, ea quæ efficeretur aliquid. In eo, quod efficeret, vim esse censebant; in eo autem quod efficeretur, materiam quandam; IN UTROQUE TAMEN UTRUMQUE. Neque enim materiam ipsam cohærere potuisse, si nulla vi contineretur, neque VIM SINE ALIQUA MATERIA; nihil est enim, quod non alicubi esse cogatur†." *They divided nature into two things, as the first principles; one whereof is the efficient or artificer, the other that which offers itself to him for things to be made out of it. In the efficient principle, they acknowledged active force; in the passive, a certain matter; but so, that in* EACH BOTH OF THESE WERE TOGETHER: *forasmuch as neither the matter could cohere together unless it were contained by some active force, nor* THE ACTIVE FORCE SUBSIST OF ITSELF WITHOUT MATTER; *because that is nothing which may not be compelled to be somewhere.* Agreeably to this strange doctrine, Arrian, the interpreter of Epictetus, says of himself, ειμι ανθρωπος, μερος των παντων, ὡς ωρα ἡμερας, "I am a man (a part of the το παν or *universe*), as an hour is part of the day.

Aristotle himself is generally supposed to have believed in the eternal existence of two substances, *mind* and *matter*; but treating of the generation of animals, he says, ενδε το παντι θερμοτης ψυχικη, ὡς τροπον τινα παντα ψυχης ειναι πληρη διο συνισταται ταχεως ὁποταν εμπεριληφθη*, *In the universe there is a certain animal heat, so as that after a manner all things are full of mind; wherefore they are quickly completed (or made complete animals) when they have received a portion of that heat.* This *heat*, from which, according to Cicero‡, the Stagyrite derived all souls, has, it must be confessed, a very material appearance; insomuch that the learned Mosheim seems to have been doubtful whether he admitted of any immaterial principle in man; but for this doubt there appears to us to be no solid foundation. Aristotle expressly declares, that *this heat is not fire* nor any *such power, but a spirit which is in the seeds* or *elementary principles of bodies*; τουτο δε ου πυρ, ουδε τοιαυτη δυναμις εστιν, αλλα το εμπεριλαμβανομενον εν τω σπερματι και εν τω αφρωδει πνευμα*. And as the excellent person himself acknowledes (N), that Aristotle taught the existence of two principles, God and matter, not indeed subsisting separately, but eternally linked together by the closest union; we think it follows undeniably, that this heat, from which he derived all souls, must be that mind which he called *God*, and which he considered as the actuating soul of the universe. Of the Immortality of the Soul.

Upon these principles neither Aristotle nor the Stoics could believe with Plato, that in the order of nature there was first an emanation from the supreme mind to animate the universe, and then through this universal soul other emanations to animate mankind. The Stagyrite believed, that the Supreme Mind himself is the soul of the world, and that human souls are immediately derived from him. The genuine Stoics, acknowledging but one substance, of necessity considered both the souls and bodies of men as portions of that substance, which they called το εν; though still they affected to make some unintelligible distinction between body and mind. But however the various schools differed as to those points, they were unanimous as to the soul's being a part of the self-existing Substance; and Cicero gives their whole system from Pacuvianus in words which cannot be misunderstood:

Quicquid est hoc, omnia animat, format, alit, auget, creat,
Sepelit, recipitque in sese omnia, omniumque idem est Pater:
Indidemque eadem, quæ oriuntur de integro, atque eodem occidunt.

267 To these verses he immediately subjoins the following query: "Quid est igitur, cur, cum domus sit omnium una, eaque communis, cumque *animi hominum* SEMPER FUERINT, FUTURIQUE SINT, cur ii, quid ex quoque eveniat, et quid quamque rem significet, perspicere non possint||?" And upon the same principle he elsewhere argues, not merely for the immortality, but for the *eternity* and *necessary existence* of the soul: "Animorum nulla in terris origo invenire potest: His enim in naturis nihil inest, quod vim memoriæ mentis, cogitationis habeat; quod et præterita teneat, et futura provideat, et complecti possit præsentia; quæ sola divina sunt. Nec invenietur unquam, unde ad hominem venire possint, nisi a Deo. Ita quicquid est illud, quod sentit, quod sapit, quod vult, quod viget, cæleste et divinum est: OB EAMQUE REM ÆTERNUM SIT NECESSE EST*." This was indeed securing the future permanency of the soul in the most effectual manner; for it is obvious, that what had not a beginning can never have an end, but must be of eternal and necessary existence. Upon these principles they maintained the necessary existence of the soul;

|| *De Divinatione*, lib. i. cap. 57.

* *Frag. de Consolatione.*

268 But when the ancients attribute a proper eternity to the soul, we must not suppose that they understood it to be eternal in its *distinct* and *personal existence*. They believed that it proceeded or was *discerpted* in *time* from the But not in its distinct and personal capacity.

tion, and even the coherence of the minute particles of body, to the immediate agency of mind, of course furnishes every human body with at least *four minds*. This fourth mind differs not from the *plastic nature* of Cudworth, and is likewise a Platonic notion apparently better founded. That there are in our bodies motions perpetually carried on by the agency of something which is not the principle of either our intelligence, our passions, or our appetites, is a fact which cannot be denied; but if those motions proceed immediately from mind, it must be either from the *supreme* mind, or from some *subordinate* mind, acting under the supreme, but wholly *distinct from and independent* of that which each man calls himself.

(N) "Non cum illis componi prorsus potest ARISTOTELES, qui bina rerum separataque statuunt principia, Deum et materiam. Arctissime enim utrumque hoc initium conjunxit Stagyrita, atque ipsa naturæ necessitate Deum cohærere cum mole hac corporea putavit." *Cudworth's Intellectual System*, Book I. Chap iv. Sect. 6. Note 3.

Of the Immortality of the Soul.

the substance of God, and would *in time* be again *resolved* into that substance. This they explained by a closed vessel filled with sea-water; which swimming a while upon the ocean, does, on the vessel's breaking, flow in again, and mingle with the common mass. They only differed about the time of this reunion; the greater part holding it to be at death; but the Pythagoreans not till after many transmigrations. The Platonists went between these two opinions; and rejoined pure and unpolluted souls immediately to the Universal Spirit; but those which had contracted much defilement, were sent into a succession of other bodies, to be purged and purified, before they returned to their parent substance.‡"

‡ *Warburton's Divine Legation.*

269 A similar doctrine held by the Bramins.

A doctrine similar to this of Plato has been held from time immemorial by the Bramins in India, whose sacred books teach, "That intellect is a PORTION of the GREAT SOUL of the universe, breathed into all creatures, to animate them for a certain time; that after death it animates other bodies, or returns like a *drop* into that *unbounded ocean* from which it first arose; that the souls of men are distinguished from those of other animals, by being endowed with reason and with a consciousness of right and wrong; and that the soul of him who adheres to right as far as his powers extend, is at death ABSORBED INTO THAT DIVINE ESSENCE, never more to reanimate flesh. On the other hand, the souls of those who do evil, are not at death disengaged from all the elements; but are immediately cloathed with a body of fire, air, and *akash* (a kind of celestial element, through which the planets move, and which makes no resistance) in which they are for a time punished in hell. After the season of their grief is over, they reanimate other bodies; and when they arrive through these transmigrations at a state of purity, they are absorbed into God, where all PASSIONS are UTTERLY UNKNOWN, and where CONSCIOUSNESS IS LOST IN BLISS‡."

‡ See *Preliminary Dissertation to Dow's History of Indostan.*

270 This doctrine incompatible with a future state of rewards and punishments, and

Whether the Greeks derived their notions of the divinity and transmigration of souls from the east, or whether both they and the Bramins brought the same doctrines at different periods from Egypt, it is foreign from the purpose of this article to inquire. Certain it is, that the philosopher's of Greece and India argued in the very same manner, and upon the very same principles, for the *natural* immortality of the soul; and that the immortality which they taught was wholly incompatible with God's moral government of the world, and with a future state of rewards and punishments. That this is true of the doctrine of the Bramins, is evident from the last quoted sentence: for if the soul, when absorbed into the Divine essence, loses all consciousness of what it did and suffered in the body, it cannot possibly be rewarded for its virtues practised upon earth. That the philosophers of Greece taught the same cessation of consciousness, might be inferred with the utmost certainty, even though we had not Aristotle's express declaration to that purpose: For as they all believed their souls to have existed before they were infused into their bodies, and as each must have been conscious that he remembered nothing of his former state (o), it was impossible to avoid concluding, that in the future state of his soul as little would be remembered of the present. Accordingly Aristotle teaches, that "the agent intellect only is immortal and eternal, but the passive corruptible",—τουτο μονον αθανατον και αιδιον ὁ δε παθητικος νους φθαρτος.* Cudworth thinks this a very doubtful and obscure passage; but Warburton, whose natural acuteness often discovered the sense of ancient authors when it had escaped the sagacity of abler scholars, has completely proved, that by the *agent intellect* is meant the *substance* of the soul, and by the *passive* its *particular perceptions*. It appears therefore that the Stagyrite, from the common principle of the soul's being a part of the Divine substance, draws a conclusion against a future state of rewards and punishments; which though all the philosophers (except Socrates) embraced, yet all were not so forward to avow.

* De anima, lib. 3. cap.

271 Gross absurdity itself;

That the hypothesis of the soul's being a part of the Divine substance is a gross absurdity, we surely need not spend time in proving. The argument long ago urged against it by St Austin must ere now have occurred to every reader. In the days of that learned father of the church, it was not wholly given up by the philosophers; and in his excellent work of the *City of God*, he thus exposes its *extravagance* and impiety: "Quid infelicius credi potest, quam Dei partem vapulare, cum puer vapulat? Jam vero *partes Dei* fieri *lascivas*, *iniquas*, *impias*, atque omnino *damnabiles*, quis ferre potest nisi qui prorsus insanit?"

272 Yet ... from which ...

But though this hypothesis be in the highest degree absurd and wholly untenible, we apprehend it to be the only principle from which the *natural* or *essential* immortality of the soul can possibly be inferred. If the soul had a *beginning*, it *may* have an *end*; for nothing can be more evident than that the being which had not existence of itself cannot of itself have perpetuity of existence. Human works, indeed, continue in being after the power of the workman is withdrawn from them; but between human works and the Divine there is this immense difference, that the former receive from the artist nothing but their form; whereas the latter receive from the Creator both their form and their substance. Forms are nothing but modifications of substance; and as substances depend upon God and not upon man, human works are continued in being by that fiat of the Creator, which made the substances of which they are composed susceptible of different forms, and of such a nature as to retain for a time whatever form may be impressed upon them. Human works therefore are continued in being by a power different from that by which they are finished; but the works of God depend wholly upon that power by which they were originally brought into existence; and were the Creator to withdraw his supporting energy, the whole creation would sink into nothing.

(o) This is expressly acknowledged by Cicero, though he held with his Greek masters the eternity of the soul. In answer to some very foolish assertions concerning the evil of death, he says, "Ita, qui nondum nati sunt, miseri jam sunt, quia non sunt: et nos ipsi, si post mortem miseri futuri sumus, miseri fuimus antequam nati. Ego autem *non commemini, antequam sum natus, me miserum. Tuscul.* lib. 1. cap. 6.

Self-evident as this truth certainly is, ſome eminent philoſophers *ſeem* to have queſtioned it. "No ſubſtance or being (ſays Mr Baxter *) can have a natural tendency to annihilation, or to become nothing. That a being which once exiſts ſhould ceaſe to exiſt is a real effect, and muſt be produced by a real cauſe: But this cauſe could not be planted in the nature of any ſubſtance or *being* to become a tendency of its nature; *for it could not be a free cauſe*, otherwiſe it muſt be a *being* itſelf, the ſubject of the *attribute freedom*, and therefore not the property of another *being*; *nor a neceſſary cauſe*, for ſuch a cauſe is only the effect of ſomething impoſing that neceſſity, and ſo no cauſe at all."

That the author's meaning in this argument is good, cannot, we think, be controverted; but he has not expreſſed himſelf with his uſual accuracy. He ſeems to confound *cauſes* with the *abſence* of cauſes, and the *effects* of the *former* with the *conſequences* of the *latter*. The viſible world was brought into exiſtence by the actual energy of the power of God; and as the viſible world had nothing of itſelf, it can *remain* in exiſtence only by a *continuance* of the *ſame energy*. This energy therefore is at the preſent moment as *real a cauſe* as it was ſix thouſand years ago, or at any paſt period when it may have been firſt exerted; and the viſible world is its *real and permanent effect*. But would the ceaſing of this energy be likewiſe a *cauſe?* It would certainly be followed with the annihilation of the viſible world, juſt as the withdrawing of the ſun-beams would be followed with darkneſs on the earth. Yet as no one has ever ſuppoſed that darkneſs, a non-entity, is a *poſitive effect* of the ſun or of his beams, but only a mere negative conſequence of their abſence; ſo, we think, no one who believes in creation can conſider that deſtruction which would inevitably follow the withdrawing of the energy by which all things are ſupplied, as the *poſitive effect* of a contrary energy, or as any thing more than a *negative conſequence* of the ceaſing of that volition or energy of power by which God at firſt brought things into exiſtence. For "where the *foundation* of exiſtence lies *wholly* in the power of an infinite Being *producing*, the *ground* of the *continuance* of that exiſtence muſt be wholly in the ſame power *conſerving*; which has, therefore, with as much truth as frequency, been ſtyled a continued creation (P)."

The force of this reaſoning Mr Baxter certainly ſaw when he ſaid, that "a tendency to perſevere in the ſame ſtate of nature, and a tendency to change it, are contradictories, and impoſſible to be planted in the ſame ſubject at once: or, not to urge the contradiction, if the laſt prevailed, the remaining in the ſame ſtate for any given time would be impoſſible. We forget the true cauſe of all theſe tendencies, *the will of God*, which it is abſurd to ſuppoſe contrary to itſelf. The tendency in matter to perſevere in the ſame ſtate of reſt or motion, is nothing but *the will of the Creator*, who preſerves all things in their exiſtence and manner of exiſtence: nor can we have recourſe to any other cauſe for the preſervation of immaterial ſubſtance in its exiſtence. Therefore theſe tendencies are to be aſcribed to the will of God, and it is abſurd to ſuppoſe them contrary."

Immortality of the Soul.

276 Analogical evidence of the immortality of the ſoul, and a moral proof of a future ſtate of rewards and puniſhments.

All this is unqueſtionably true. The exiſtence or non-exiſtence of matter and of created ſpirits depends wholly upon the will of God; and we cannot ſuppoſe him to be willing to-day the reverſe of what he willed yeſterday, becauſe we know that all his volitions are directed by unerring wiſdom. We have likewiſe the evidence of experience, that nothing is ever ſuffered to periſh but particular ſyſtems, which periſh only *as ſyſtems* by a decompoſition of their parts. A being, which like the ſoul has no parts, can ſuffer no decompoſition; and therefore, if it periſh, it muſt periſh by annihilation. But of annihilation there has not hitherto been a ſingle inſtance; nor can we look for a ſingle inſtance without ſuppoſing the volitions of God to partake of that unſteadineſs which is characteriſtic of man. Corporeal ſyſtems, when they have ſerved their purpoſe, are indeed reſolved into their component parts; but the matter of which they were compoſed, ſo far from being *loſt*, becomes the matter of *other ſyſtems* in endleſs ſucceſſion. Analogy, therefore, leads us to conclude, that when the human body is diſſolved, the immaterial principle by which it was animated continues to think and act, either in a ſtate of ſeparation from all body, or in ſome material vehicle to which it is intimately united, and which goes off with it at death; or elſe that it is preſerved by the Father of ſpirits, for the purpoſe of animating a body in ſome future ſtate. When we conſider the different ſtates through which that living and thinking *individual*, which each man calls himſelf, goes, from the moment that it firſt animates an embryo in the womb, to the diſſolution of the man of fourſcore; and when we reflect likewiſe on the wiſdom and *immutability* of God, together with the various diſſolutions of corporeal ſyſtems, in which we know that a ſingle atom of matter has never been loſt; the preſumption is certainly ſtrong, that the ſoul ſhall ſubſiſt after the diſſolution of the body. But when we take into the conſideration the *moral* attributes of God—his juſtice and goodneſs, together with the unequal diſtribution of happineſs and miſery in the preſent world; this preſumption from analogy amounts to a *complete moral proof* that there ſhall be a future ſtate of rewards and puniſhments (Q). (See Moral *Philoſophy* and Religion); and if we eſtimate the duration of the rewards by the benevolence of Him by whom they are to be conferred, we cannot imagine them ſhorter than eternity.

(P) See Stillingfleet's *Origines Sacræ*, where this queſtion is treated in a very maſterly manner by one of the ableſt metaphyſicians of the laſt century. See alſo our article Providence.

(Q) It was by ſuch arguments that Socrates reaſoned himſelf into the belief of a future ſtate of rewards and puniſhments. He was ſingular, as we have already obſerved, in this belief; and he was as ſingular in confining himſelf to the ſtudy of morality. "What could be the cauſe of this belief, but this reſtraint, of which his belief was a natural conſequence? For having confined himſelf to morals, he had nothing to miſlead him; whereas the reſt of the philoſophers, applying themſelves with a kind of fanaticiſm to *phyſics* and *metaphyſics*, had drawn a number of abſurd, though ſubtle, concluſions, which directly oppoſed the conſequences of thoſe moral arguments." *Warburton's Div. Leg.* vol. ii.

Of Necessity and Liberty.

Chap. V. *Of* Necessity *and* Liberty.

277
Freedom of agency implied in accountableness.

In the preceding chapter we have adverted to that great *moral proof* for a future state, and the immortality of the soul, arising from the relation in which man, as a being accountable for his conduct, stands to a God of almighty power, infinite wisdom, and perfect justice. But the circumstance of accountableness implies freedom of agency; for it is contrary to all our notions of right and wrong (see Moral *Philosophy*), that a man should be either rewarded or punished for actions which he was necessitated or compelled to perform.

278
Every man has power to do what he wills:

Human actions are of three kinds: one, where we act by instinct, without any view to consequences; one, where we act by will, in order to obtain some end; and one, where we act against will. It is the second kind of actions only which confers upon the agent merit or demerit. With respect to the first, he acts blindly (see Instinct), without deliberation or choice; and the external act follows from the instinctive impulse, no less necessarily than a stone by its gravity falls to the ground. With respect to the last, he is rather an instrument than an agent; and it is universally allowed, that were a strong man to put a sword into the hand of one who is weaker, and then to force it through the body of a third person, he who held the sword would be as guiltless of the murder as the sword itself. To be intitled to rewards, or liable to punishment, a man must act voluntarily; or in other words, his actions must proceed from that energy of mind which is termed *volition*: and, we believe, it has never been denied, that all men have power to do whatsoever they *will*, both with respect to the operations of their minds and the motions of their bodies, uncontrolled by any foreign principle or cause. "Every man (says Priestley) is at liberty to turn his thoughts to whatever subject he pleases, to consider the reasons for or against any scheme or proposition, and to reflect upon them as long as he shall think proper; as well as to walk wherever he pleases, and to do whatever his hands and other limbs are capable of doing." Without such liberty as this, morality is inconceivable.

279
But different opinions entertained of the freedom of volition.

But though philosophers have in general agreed with respect to the power which a man has to perform such actions as he wills, they have differed widely in opinion respecting the nature of his volitions. That these are the result of motives, has seldom if ever been questioned; but whether that result be necessary, so as that the agent has no self-determining power to decide between different motives, has been warmly disputed by men equally candid, impartial, and intelligent. The principal writers on the side of necessity are, Hobbes, Collins, Hume, Leibnitz, Lord Kames, Hartley, Edwards, Priestley, and perhaps Locke. On the other side are, Clarke, King, Law, Reid, Butler, Price, Bryant, Wollaston, Horsley, Beattie, and Gregory, &c. To give a short view of this celebrated question, is all that our limits will permit; and as we do not think ourselves competent to settle the dispute, it were perhaps a thing desirable to give the opposite reasonings in the words of those eminent authors themseves. It must, however, be obvious to the reader, that the style and manner of so many different writers are extremely various, and that to introduce them all into our abstract, would make the whole a mass of confusion. We shall, therefore, select one writer to plead the cause of necessity, supplying his defects from those who, though inferior to him on the whole, may yet have argued more ably on some particular points which the question involves: and to this combined reasoning we shall subjoin such answers as to us appear most conclusive. Hartley, Hume, and Priestley, are perhaps the most profound reasoners on the side of necessity; but there is so much more perspicuity in the arguments of Lord Kames, that we cannot help preferring them, as being on the whole better calculated to give the ordinary reader a fair view of the subject.

28[0]
Scheme of necessity according to L. Kames.

"Into actions done with a view to an end (says his Lordship §), desire and will enter: desire to accomplish the end goes first; the will to act, in order to accomplish the end, is next; and the external act follows of course. It is the will then, that governs every external act done as a mean to accomplish an end; and it is desire to accomplish the end that puts the will in motion; desire, in this view, being commonly termed the *motive* to act. But what is it that raises desire? The answer is ready: It is the prospect of attaining some agreeable end, or of evading one that is disagreeable. And if it be inquired, what makes an object agreeable or disagreeable? the answer is equally ready: It is our nature that makes it so. Certain visible objects are agreeable, certain sounds, and certain smells: other objects of these senses are disagreeable. But there we must stop; for we are far from being so intimately acquainted with our own nature as to assign the causes.

§ Hist. of the Hist. of Man, Book Sketch part I sect. S

"With respect to instinctive actions, no person, I presume, thinks that there is any freedom. With respect to voluntary actions, done in order to produce some effect, the necessity is the same, though less apparent at first view. The external action is determined by the will; the will is determined by desire; and desire by what is agreeable or disagreeable. Here is a chain of causes and effects, not one link of which is arbitrary, or under command of the agent: he cannot will but according to his desire; he cannot desire, but according to what is agreeable or disagreeable in the objects perceived: nor do these qualities depend on his inclination or fancy; he has no power to make a beautiful woman ugly, nor to make a rotten carcase smell sweetly.

"Many good men, apprehending danger to morality from holding our actions to be necessary, endeavour to break the chain of causes and effects above mentioned; maintaining, that whatever influence desire or motives may have, it is the agent himself who is the cause of every action; that desire may advise, but cannot command; and, therefore, that a man is still free to act in contradiction to desire and to the strongest motives.

"That a being may exist which in every case acts blindly and arbitrarily, without having any end in view, I can make a shift to conceive: but it is difficult for me even to imagine a thinking and rational being, that has affections and passions, that has a desirable end in view, that can easily accomplish this end; and yet after all can fly off or remain at rest, without any cause, reason, or motive, to sway it. If such a

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whimſical being can poſſibly exiſt, I am certain that man is not that being. There is not perhaps a perſon above the condition of a changeling, but can ſay *why* he did ſo and ſo, what moved him, what he intended. Nor is a ſingle fact ſtated to make us believe that ever a man acted againſt his own will or deſire, who was not compelled by external force.—On the contrary, conſtant and univerſal experience proves, that human actions are governed by certain inflexible laws; and that a man cannot exert his ſelf-motive power but in purſuance of ſome deſire or motive.

"Had a motive always the ſame influence, actions proceeding from it would appear no leſs neceſſary than the actions of matter. The various degrees of influence that motives have on different men at the ſame time, and on the ſame man at different times, occaſion a doubt, by ſuggeſting a notion of chance. Some motives, however, have ſuch influence as to leave no doubt: a timid female has a phyſical power to throw herſelf into the mouth of a lion roaring for food; but ſhe is with-held by terror no leſs effectually than by cords: if ſhe ſhould ruſh upon a lion, would not every one conclude that ſhe was frantic? A man, though in a deep ſleep, retains a phyſical power to act, but he cannot exert it. A man, though deſperately in love, retains a phyſical power to refuſe the hand of his miſtreſs; but he cannot exert that power in contradiction to his own ardent deſire, more than if he were faſt aſleep. Now, if a ſtrong motive have a neceſſary influence, there is no reaſon for doubting, but that a weak motive muſt alſo have its influence, the ſame in kind, though not in degree. Some actions indeed are ſtrangely irregular; but let the wildeſt actions be ſcrutiniſed, there will always be diſcovered ſome motive or deſire, which, however whimſical or capricious, was what influenced the perſon to act. Of two contending motives, is it not natural to expect that the ſtronger will prevail, however little its exceſs may be? If there be any doubt, it muſt ariſe from a ſuppoſition, that a weak motive may be reſiſted arbitrarily. Where then are we to fix the boundary between a weak and a ſtrong motive? If a weak motive can be reſiſted, why not one a little ſtronger, and why not the ſtrongeſt? Between two motives oppoſing each other, however nearly balanced, a man has not an arbitrary choice, but muſt yield to the ſtronger. The mind, indeed, fluctuates for ſome time, and finds itſelf in a meaſure looſe: at laſt, however, it is determined by the more powerful motive, as a balance is by the greater weight after many vibrations.

"Such, then, are the laws that govern our voluntary actions. A man is abſolutely free to act according to his own will; greater freedom than which is not conceivable. At the ſame time, as man is made accountable for his conduct to his Maker, to his fellow-creatures, and to himſelf, he is not left to act arbitrarily; for at that rate he would be altogether unaccountable: his will is regulated by deſire; and deſire by what pleaſes or diſpleaſes him.—Thus, with regard to human conduct, there is a chain of laws eſtabliſhed by nature; no one link of which is left arbitrary. By that wiſe ſyſtem, man is made accountable; by it he is made a fit ſubject for divine and human government; by it perſons of ſagacity foreſee the conduct of others; and by it the preſcience of the Deity with reſpect to human actions is clearly eſtabliſhed."

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Of the doctrine of neceſſity, a more perſpicuous or plauſible view than this is not to be found in any work with which we are acquainted. It is indeed defective perhaps, as his Lordſhip only *hints* at the *nature* of that relation which ſubſiſts between motive and action; but from his comparing the fluctuations of the mind between two contending motives, to the vibrations of a balance with different weights in the oppoſite ſcales, there is no room to doubt but that he agreed exactly in opinion with Mr Hume and Dr Prieſtley. Now both theſe writers hold, that the relation of motives to volition and action, is the very ſame with that which ſubſiſts between cauſe and effect in phyſics, as far as they are both known to us. 281
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and
"It is univerſally allowed (ſays Mr Hume †), that matter, in all its operations, is actuated by a neceſſary force; and that every natural effect is ſo preciſely determined by the energy of its cauſe, that no other effect, in ſuch particular circumſtances, could poſſibly have reſulted from it. The degree and direction of every motion is, by the laws of nature, preſcribed with ſuch exactneſs, that a living creature may as ſoon ariſe from the ſhock of two bodies, as motion in any other degree or direction than what is actually produced by it. Would we, therefore, form a juſt and preciſe idea of *neceſſity*, we muſt conſider whence that idea ariſes, when we apply it to the operation of bodies. But our idea of this kind of neceſſity and cauſation ariſes entirely from the uniformity obſervable in the operations of nature, where ſimilar objects are conſtantly conjoined together, and the mind is determined by cuſtom to infer the one from the appearance of the other. Theſe two circumſtances form the whole of that neceſſity which we aſcribe to matter. Beyond the *conſtant conjunction* of ſimilar objects, and the conſequent *inference* from one to the other, we have no notion of any neceſſity or connection." He then gives a pretty long detail to prove a great uniformity among the actions of men in all nations and ages; and concludes that part of his argument with affirming, "not only that the conjunction between motives and voluntary actions is as regular and uniform as that between the cauſe and effect in any part of nature; but alſo, that this regular conjunction has been univerſally acknowledged among mankind, and has never been the ſubject of diſpute either in philoſophy or common life." He afterwards obſerves, "that men begin at the wrong end of this queſtion concerning liberty and neceſſity, when they enter upon it by examining the faculties of the ſoul, the influence of the underſtanding, and the operations of the will. Let them firſt diſcuſs a more ſimple queſtion, namely, the operations of body, and of brute unintelligent matter; and try whether they can there form any idea of cauſation and neceſſity, except that of a conſtant conjunction of objects and ſubſequent inference of the mind from one to another. If theſe circumſtances form in reality the whole of that neceſſity which we conceive in matter, and if theſe circumſtances be alſo univerſally acknowledged to take place in the operations of the mind, the diſpute is at an end; at leaſt muſt

† *Inquiry concerning Human Underſtanding*, ſect. 8.

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must be owned to be thenceforth merely verbal. When we consider how aptly *natural* and *moral* evidence link together, and form only one chain of argument, we shall make no scruple to allow that they are of the same nature, and derived from the same principles.—Between a connected chain of natural causes and voluntary actions, the mind feels no difference in passing from one link to another; nor is less certain of a future event which depends upon motives and volitions, than if it were connected with the objects present to the memory and senses by a train of causes, cemented together by what we are pleased to call a *physical* necessity. The same experienced union has the same effect on the mind, whether the united objects be motives, volition and action, or figure and motion. We may change the names of things, but their nature and their operation on the understanding never change."

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Dr Priestley, in words a little different, teaches the very same doctrine which was taught by Mr Hume.—"In every determination of the mind (says he *), or in cases where volition and choice are concerned, all the previous circumstances to be considered are the *state of mind* (including *every thing belonging to the will itself*), and the *views of things* presented to it; the latter of which is generally called the *motive*, though under this term some writers comprehend them both. To distinguish the *manner* in which events depending upon *will* and *choice* are produced, from those in which no volition is concerned, the former are said to be produced *voluntarily*, and the latter *mechanically*. But the same general maxims apply to them both. We may not be able to determine *à priori* how a man will act in any particular case; but it is because we are not particularly acquainted with his *disposition of mind*, *precise situation*, and *views of things*. But neither can we tell in which way the wind will blow to-morrow, though the *air* is certainly subject to no other than necessary laws of motion.

* *The Doctrine of philosophical Necessity illustrated.*

"It is universally acknowledged, that there can be no effect without an adequate cause. This is even the foundation on which the only proper argument for the being of a God rests. And the necessarian asserts, that if, in any given state of mind, with respect both to *disposition* and *motives*, two different determinations or volitions be possible, it can be so on no other principle, than that one of them shall come under the description of an *effect without a cause*; just as if the beam of a balance might incline either way, though loaded with equal weights. It is acknowledged, that the mechanism of the balance is of one kind, and that of the mind of another; and, therefore, it may be convenient to denominate them by different words; as, for instance, that of the balance may be termed a *physical*, and that of the mind a *moral* mechanism. But still, if there be a *real mechanism* in both cases, so that there can be only one result from the same previous circumstances, there will be a *real necessity*, enforcing an absolute certainty in the event. For it must be understood, that all that is ever meant by *necessity in a cause*, is that which produces *certainty in the effect*."

Such is the nature of human volitions, according to every necessarian of eminence who has written on the subject since the days of Hobbes: and if this theory be just, if there be a constant and inseparable conjunction of motives and actions similar to that of cause and effect in physics, it is obvious, that in volition the mind is as inert as body is in motion.

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This consequence is indeed avowed and insisted upon by Hume, Priestley, and their adherents; whilst the advocates for human liberty, on the other hand, contend for an absolute exemption of the will from all internal *necessity*, arising from its own frame and constitution, the impulse of superior beings, or the operations of objects, reasons, or motives, &c. By this they do not mean, that between motives and volitions there is no relation whatever, or that a man can ever choose evil as evil, or refuse good as good. Such an assertion would be contrary to consciousness and universal experience. But what they endeavour to prove is, that the conjunction of motive and volition is not inseparable, like that of cause and effect in physics; that a man may in most cases choose according to any one of two or more motives presented to his view; that by choosing any thing, he may make it in some measure agreeable by his own act, or, to speak more properly, may bend his desire to it; that in volition, the mind is not inert; and that, therefore, we are under no *necessity* to act in a particular manner in any given case whatever.

That the conjunction of motive and action is not constant like that of cause and effect in physics, and that by consequence the mind in forming volitions is not inert, has been evinced by Dr Gregory with the force and precision of mathematical demonstration.—Former writers on the side of liberty had often observed, that upon the supposition of the *inertia* of mind, a man, with equal and opposite motives presented at once to his view, would, during their continuance, remain perfectly at rest, like a balance equally loaded in both scales. The observation is admitted to be just by all the advocates for necessity; but they contrive to evade its consequences, by denying that in any given case a man can be at once assailed by two equal and opposite motives. Thus, when it is said that a porter, standing with his face due north, must remain in that position at perfect rest, as long as equal motives shall at once be offered to him for travelling eastward and westward, the necessarians admit the force of the argument; but when it is added that a guinea, offered for every mile that he should travel in each of these opposite directions, ought therefore to fix him at rest till one of the offers be withdrawn, they deny that the desire of gaining the guineas is the *whole* of the motives which operate upon his mind. He may have, say they, some secret reason which we cannot discern for preferring the one direction to the other; and that reason, added to the guinea, will make him go eastward or westward, just as an ounce thrown into either scale of a balance poised by equal weights will make that scale preponderate. Though we think that this solution of the difficulty can satisfy no man who is not already biassed to the necessarian system; and though, even were it to be admitted, it seems to militate against the constant conjunction of motives and actions, unless it can be proved that the porter must travel the road which he has been necessitated to choose with reluctance and a heavy heart; yet as it may admit of endless quibbling upon ambiguous words,

words, the philofophical world is much indebted to Dr Gregory ‡ for an argument which, in our opinion, can neither be overturned nor evaded, and which demonftrates that the conjunction of motive and action cannot be conftant and infeparable, like that of caufe and effect in phyfics.

His reafoning is to this purpofe: Suppofe a porter to be offered a guinea for every mile that he fhall travel directly eaftward. If there be no phyfical caufe or moral motive to keep him at reft, or to induce him to move in another direction, there cannot be a doubt, upon either hypothefis, but he will gladly embrace the propofal, and travel in the direction pointed out to him, till he fhall have gained as much money as to fatisfy his moft avaricious defires. The fame thing would have happened, if a guinea had been offered for every mile that he fhould travel due fouth. In thefe two cafes taken feparately, the relation between the man's motives and his actions would be ftrikingly analogous to that between a fingle impulfe and motion in phyfics. Let us now fuppofe the two offers to be made at the fame inftant, and the man to be affured that if he travel eaftward he can have no part of the reward promifed for his travelling to the fouth, and that if he travel fouthward he can have no part of the reward promifed for his travelling to the eaft. What is he to do in this cafe? If his mind be inert in volition, and if the two motives operate upon him with the fame neceffity that caufes operate in phyfics, it is obvious that the man could travel neither towards the eaft nor towards the fouth, but in a diagonal direction from north-weft to fouth-eaft; and this he muft do *willingly*, although perfectly fatisfied that he could gain nothing by his journey. As this inference is contrary to fact and univerfal experience, the Doctor very juftly concludes that the premifes, from which it is deduced by mathematical reafoning, muft be falfe and abfurd; or, in other words, that the relation between motive and action cannot be that of conftant conjunction, like the relation between caufe and effect in phyfics.

He ufes many arguments of the fame kind, and equally convincing, to prove the abfurdity of fuppofing the inertnefs of mind, and only an occafional conjunction of motives and actions; but we forbear to quote them, both becaufe we wifh his book to be read, and becaufe we think the fingle argument which we have borrowed from him fufficient to demolifh the theory of Prieftley and Hume, which refts wholly upon the hypothefis of the *conftant* conjunction of motive and action.

But is it then not really true, that the external action is determined by the will, the will by defire, and defire by what is agreeable or difagreeable? That the external action is univerfally determined by the will, is certainly true; but that the will is neceffitated and univerfally determined by the defire is as certainly falfe. If Potiphar's wife was handfome, and made her propofal to Jofeph with any degree of female addrefs; and if his conftitution was like that of other young men; there cannot be a doubt but that he felt a *defire* to do what fhe requefted of him: yet we know that he *willed* to do otherwife, and in direct oppofition to his *defire* fled from the room. Perhaps it may be faid, that his volition to flee was the effect of a contrary and ftronger *defire* not to fin againft God; but this is confounding the reader, by calling two energies of mind, between which there is little or no fimilarity, by the fame name. He perceived, or knew, that to comply with his miftrefs's requeft would be to fin againft God; he knew that he ought not to fin againft God, and therefore he chofe or determined himfelf not to do it. We can eafily conceive how the prefence, attitudes, and addrefs, of the lady might be agreeable to him, and excite defire. There may very poffibly be more than one of our readers, who, during the courfe of their lives, have experienced fomething of the fame kind: but could abftract truth be in the fame way agreeable, fo as to excite in his mind a *defire* of virtue fufficient to annihilate or banifh the *defire* of the woman? As well may it be faid that one fenfation can annihilate another, that the beautiful colours of the rainbow can remove the fenfation of ftench from the mind of him who is plunged into the midft of a dunghill, or that the fmell of a rofe can make a man infenfible to the pain of a ftroke inflicted by a bludgeon. Senfitive defire, and the perception of duty, are things fo totally different, that to confider them as operating againft each other, like different weights in the oppofite fcales of a balance, is as abfurd as to fuppofe that found can operate againft colour, or colour againft fmell. A man may prefer found to colour, or colour to fmell, and act accordingly; but the determination muft be wholly his own, unlefs thefe two fenfations be themfelves either agents or phyfical caufes of the *fame kind*, like the weights in the oppofite fcales of the balance.

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The advocates for liberty do not pretend, that in matters of importance a man ever acts without fome motive or reafon for his conduct. All that they infift upon is, that between two or more motives of different kinds he has a liberty of choice, and that he does not always determine himfelf by that which he knows to be the greateft. Without fuch freedom, they think men might be often brought into fituations where they could not act at all, and where inaction would at the fame time be in the higheft degree abfurd. Thus, were two bags of gold, containing each a thoufand or ten thoufand guineas, to be placed on the fame table, before a man whofe family is perifhing for want, and were the man to be told that he might take either of them, but not both, is it conceivable that he would be held in perpetual fufpence between the two? No; he would inftantly and with alacrity take up one of them, without feeling the leaft regret for the want of the other. This action would, indeed, be the confequence of a very powerful motive, the defire to obtain honeftly that wealth of which he and his family ftood fo much in need. That motive, however, being general, would draw him equally to both bags; and it remains with the neceffarians to fay by what elfe than a felf determining power he could take either the one or the other. When it is affirmed, that fuch felf determination would be an effect without a caufe, the advocates for liberty cannot help thinking that their antagonifts are guilty of advancing as an argument a *petitio principii*; for the affirmation is true, only if the mind in volition be inert, and the *inertia* of the mind is the fole queftion at iffue. If the mind be not inert, it is plain, that in confequence of a man's felf-determination, no effect would be produced without

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a sufficient cause. At any rate, motives cannot be causes. In the proper sense of the word, a cause is that which produces an effect; but the production of an effect requires active power; and power being a quality must be the quality of some being by whom it may be exerted. Power may be dormant, and therefore power without will produces no effect. Are motives, then, real beings, endowed with power and will? No; they are only views of things or mental conceptions, which in the strictest sense of the word are passive; and between two motives the mind determines itself, without receiving an impulse from either.

Nor is it only between motives of equal force that men have the power of determining themselves. Whoever believes in a future state of rewards and punishments, and yet acts in a manner which he knows to be offensive to Him who is to be the future and final judge, unquestionably prefers to the strongest of all motives, another which even to himself appears to have comparatively but very little strength. Whether there be men who occasionally act in this manner, is a question which can be decided only by an appeal to every one's consciousness. That there are, we can have no doubt; for we never met with a single individual, not biassed by system, who was not ready to acknowledge, that during the course of his life he had done many things, which at the time of action he clearly perceived to be contrary to his true interest. Without a self-determining power in the mind, this could never be the case. Did motives operate with the necessity of physical causes, it is obvious that in every possible situation the strongest must constantly prevail; and that he who in certain circumstances had in time past done any particular thing, would on a return of the same circumstances do the very same thing in every time future. Dr Priestley, indeed, wishes to persuade his readers that this is actually the case. "In every determination of the mind (says he), or in cases where volition and choice are concerned, all the previous circumstances to be considered are the *state of mind* (including *every thing belonging to the will itself*), and the various views of things presented to it;" and he affirms, that "whenever the same precise circumstances occur twice, the very same determination or choice will certainly be made the second time that was made the first." This is an assertion of which no man can controvert the truth; for it is an identical proposition. If in the circumstances previous to the determination of the mind, *every thing* belonging to the *will itself* must be included, it is self-evident that he who in any given circumstances has acted a particular part, will on a return of these circumstances act the same part a second time; for this is only saying, that he who on two different occasions shall exert volitions of the same tendency, will not on these occasions exert volitions of which the tendencies are different. But the question to be decided is, Whether a man, in the same general state of mind, possessed of the same degree of health, and conscious of the same appetites, must, in external circumstances perfectly alike, necessarily exert at all times the same volitions. That the human mind is under no such necessity, we think every man's consciousness and experience may abundantly satisfy him; for there are, perhaps, but very few who have not at one time resisted temptations, to which at another they have chosen to yield.

That there is a relation between motives and actions, must be confessed; but that relation is neither *necessity*, nor constant conjunction. If it were, all actions would be perfectly rational; and folly, as well as merit and demerit, would be banished from the conduct of men. What is the particular nature of that relation which subsists between the voluntary actions of men, and the motives from which they proceed, can be known to every individual only by an attentive and unbiassed reflection on the operations of his own mind. Without this reflection, no man can be made to understand it by the reasonings of philosophers, and with it no man can need the aid of those reasonings. That a self-determining power, such as that for which we plead, contributes to the sum of human happiness, has been shown by Archbishop King and his ingenious translator; who have proved, with the force of demonstration, that the mind can take pleasure in the object of its choice, though that object be in itself neither agreeable nor disagreeable to our natural appetites; and that if it could not, it would be vain in such a world as ours to hope for any portion of felicity. Into that detail our limits will not permit us to enter: but to the reader who wishes for further information, we beg leave to recommend the last edition of King's Origin of Evil, by Dr Law late bishop of Carlisle; without, however, vouching for the truth of all the opinions advanced by either of those learned writers.

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If it were, folly as well as merit and demerit would be banished from the world.

Before we conclude this chapter, it may be proper to observe, that it is only in volition that we are conscious of any original active power in ourselves, and that without such consciousness we could never have acquired the *notion* of active power. In our desires and appetites, we neither are active nor suppose ourselves active. Lord Kames, and most necessarians, confound desire with volition; but that they are perfectly distinct is plain from this circumstance, that we daily *desire* many things which we know to be wholly *out* of our own power *, whereas no man ever *willed* what he did not believe to be *in* his own power. We all *desire* or wish that our children may be virtuous, wise, and happy; and though we are conscious that it is not in our power to make them so, we cannot banish the desire from our breasts. But madmen only have ever *willed* virtue, wisdom, and happiness, to any person; and if there was ever a man so extravagantly mad as to exert such a volition as this, he has at the time fancied himself a divinity, and therefore believed that the object of his volition depended upon himself. When the astronomer, whose character is so admirably drawn by our great master of moral wisdom †, fancied himself the regulator of the weather and the distributor of the seasons, he might *will* either *rain* or *sunshine* as he thought proper, because he considered the object of his volition as depending upon a power imparted to him from heaven; but though he might *desire*, he could not *will*, the rising or the falling of *winds*, for these he confessed were not subjected to his authority. In a word, without freedom in volition, power is inconceivable; and therefore it is as certain that we are free agents, as that we have any notion of active powers.

* Reid's *Essays on the Active Powers*.

† *Rasselas Prince of Abyssinia*.

CHAP.

Chap. VI. *Of the* Being *and* Attributes *of* God.

It has been already observed, that as of bodies there are various kinds, endowed with various properties; so the probability is, that of minds endowed with different powers, or different degrees of power, the variety may be as great, or perhaps greater. The existence and powers of our own minds are made known to us by consciousness and reflection; and from our dependent state, and the mutability of the objects around us, we are necessarily led to infer the existence of another mind, which is independent, unchangeable, eternal, and the cause of all things which have a beginning of existence. Between that mind and our own, we can hardly avoid believing that there are many orders of "thrones, dominations, princedoms, virtues, powers;" but as we have no intuitive knowledge of such intermediate beings, and cannot form any thing which we perceive discern the *necessity* of their existence, they are not properly the objects of science. The existence, however, and many of the attributes of One First Cause, are capable of the strictest demonstration; "for the invisible things of Him from the creation of the world are clearly seen, being understood by the things which are made."

Of this great truth, the most important by far which can occupy the mind of man, many demonstrations have been given both by divines and by philosophers. We shall lay before our readers such a one as to us appears perfectly conclusive, being founded on the intuitive knowledge which we have of our own existence, and therefore independent of all theories about the nature and reality of the material world.

Every man, whether he adopt the common theory or that of Berkeley respecting matter, is conscious that he *himself* exists, and must therefore grant that *something now* exists. But if any thing exist *now* *, then must something have *always* existed; otherwise that thing which *now* exists, must either have been created by *nothing*, i. e. have been *caused by no cause*, or else it must have *created itself*, acting before it existed. Both these suppositions are so palpably absurd, that no atheist has avowed them, either among the ancients or the moderns. We must therefore admit, either that there is some one *independent* being, which now exists, and always has existed; or that the things which we know to exist at present (every man's *self* for instance), were produced by *something* which had its *existence* from *something else*, which also depended upon *some other cause*, and so on in an *infinite series of caused* or *successive beings*. But this last supposition, though it has been often made, is as grossly absurd as either of the two former. For of this infinite series, either *some one* part has *not* been successive to any other, or else *all* the several parts of it have been successive. If some one part of it was *not successive*, then it had a *first part*; which destroys the supposition of its infinity (R). If *all* the several parts of it have been successive, then have they all once been *future*; but if they have *all* been future, a time may be conceived when none of them had existence: and if so, then it follows, either that all the *parts*, and consequently the *whole* of this infinite series, must have arisen from *nothing*, which is absurd; or else that there must be something in the *whole* besides what is contained in *all the parts*, which is also absurd.

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As the possibility or impossibility of an infinite series of dependent beings is the main question at issue between the atheists and us, we shall state the preceding reasoning in a manner somewhat different. For this purpose, let us suppose some one to affirm, that the course of generation has had no beginning, and consequently that the number of successive births has been infinite. We would ask such a person, Whether before the birth of Abraham, for example §, there had past an infinite series of generations or not? If not, the course of generation must have had a beginning, which is the conclusion for which we contend. But if the series past was infinite, then at the birth of Joseph the great-grandson of Abraham, it is evident, that more generations were past, and that the number then was greater than that which was supposed to be infinite; so that upon this supposition we have a number that is both infinite and not infinite, which is a manifest contradiction. Should it be said that the number of generations was infinite, as well at the birth of Abraham as at the birth of Joseph; it will then follow, that one infinite may be greater than another of the very same kind; and consequently that an infinite may be bounded, *i. e.* be finite. But should it be alleged, that the number of births at Abraham's was finite, and became infinite when it reached to Joseph's, it will then follow, that one finite number added to another may make an infinite number, which is directly contrary to every possible notion of infinity. We might argue in the same manner against an infinite series of every kind, the very supposition of which involves the most palpable contradictions. See Chap. *Of* Infinity *and* Eternity.

§ See an *Essay towards an Eviction of the Being and Attributes of God, by Seth Ward*—Printed at Oxford, 1655.

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Whose duration is not commensurate with succession, and

From the impossibility of an infinite series it necessarily follows, that there exists, and must have existed from eternity, some one independent being, whose duration cannot be commensurate with succession, and to whom the relation of time is not applicable. Here will some atheists presently imagine, that by the same mode of reasoning they may disprove the existence of God: for do not they who thus destroy the eternity of the world, destroy at the same time the eternity of the Creator? If time itself be not eternal, how can the Deity or any thing else be so?

In urging these questions, it must be taken for granted that time is essential to all existence, and that God cannot be eternal otherwise than by a successive flux of infinite time. But it has been already shown (n° 225), that successive duration is not essential to existence; that we can even *conceive* existence without succession; and it may here be added, that if we suppose a perfect being alone in nature, we shall find it impossible to imagine any *succession of ideas*, any *flux of moments*, or any *alteration* or *increase* whatever in his knowledge and essence.

(R) Των απειρων ουκ εϛιν ουδεν πρωτον. *Arist. Phys.* lib. viii. cap. 5. sect. 4.

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eſſence. Such duration as we are acquainted with can have no relation to an immutable Being, while ſuppoſed to exiſt alone; but as ſoon as he determined to exerciſe his ſeveral attributes in the production of ſomething diſtinct from himſelf, then, and not till then, have we reaſon to think that *time, ſucceſſion*, and *increaſe*, began. Theſe atheiſtical queſtions, therefore, inſtead of containing an objection to the exiſtence of a Deity, afford a plain demonſtration of it: for ſince it is not more evident that ſomething now exiſts than that ſomething muſt have exiſted from eternity; and ſince it has been ſhown, that neither the world in its preſent ſtate, nor time, nor any thing capable of change or ſucceſſion, can poſſibly be eternal; it follows, that there muſt neceſſarily be ſome Being who, in the order of nature, is before time, and who, in the ſtability and immutable perfection of his own intelligence, comprehends at once his *yeſterday, to-day*, and *for ever*. "The atheiſts (ſays the excellent Cudworth*) can here only ſmile, or make wry faces, and ſhow their little wit in quibbling upon *nunc-ſtans*, or a *ſtanding now of eternity*; as if that *ſtanding eternity* of the *Deity* (which with ſo much reaſon hath been contended for by the ancient *genuine theiſts*) were nothing but a *pitiful ſmall moment of time ſtanding ſtill*, and as if the duration of all beings whatſoever muſt needs be like our own: whereas the duration of every thing muſt of neceſſity be agreeable to its nature; and therefore, as that whoſe *imperfect nature* is ever *flowing* like a river, and conſiſts in *continual motion* and *changes* one after another, muſt needs have accordingly a *ſucceſſive* and *flowing duration*, ſliding perpetually from *preſent* into *paſt*, and always haſting on towards the *future*, expecting ſomething of itſelf which is not yet in being; ſo muſt that whoſe perfect nature is *eſſentially immutable* have *permanent and unchanging duration*, never loſing any thing of itſelf once preſent, nor yet running forward to meet ſomething of itſelf which is not yet in being."

* *Intellectual Syſtem*, Book i. chap. 5.

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From the eternity of the ſupreme Being we neceſſarily infer his independence or ſelf-exiſtence; for that which never had a *beginning* of exiſtence cannot poſſibly have any cauſe of that exiſtence, or in any manner depend upon any other being, but muſt exiſt of itſelf, or be *ſelf-exiſtent*.

291 cannot ceaſe to be.

Eternity *ad partem poſt*, or *neceſſary exiſtence*, or the impoſſibility of ever ceaſing to be, follows from independence: For to the nature of that which exiſts without any cauſe, exiſtence muſt be eſſential. But a being whoſe exiſtence is of itſelf and eſſential to its nature, cannot be *indifferent* to exiſtence or non-exiſtence, but muſt exiſt *neceſſarily*. And here it may be proper to obſerve, that the word *neceſſity*, when applied to exiſtence, may be taken in two acceptations very different from each other §; either as it ariſes from the relation which the exiſtence of that thing, of which it is affirmed, has to the exiſtence of *other things*; or from the relation which the *actual* exiſtence of that thing has to the *manner* of its *own* exiſtence.

§ *Notes to King on Evil*, and *Law's Inquiry into the Ideas of Space*, &c.

292 What is meant by neceſſary exiſtence.

In the former ſenſe, when neceſſity of exiſtence has relation to the exiſtence of other things, it denotes that the ſuppoſition of the *non*-exiſtence of that thing of which neceſſity is affirmed, implies the non-exiſtence of things which we *know to exiſt*. Thus, ſome independent being does *neceſſarily exiſt*: becauſe, to ſuppoſe *no independent* being, implies that there are *no dependent beings*; the contrary of which we know to be true.

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In the ſecond ſenſe, when the neceſſity of exiſtence ariſes from the relation which the actual exiſtence of any thing has to the *manner* of its own exiſtence, neceſſity means, that the thing, of which it is affirmed, exiſts after ſuch a manner as that it never could in *time paſt* have *been non-exiſtent*, or can in *time future ceaſe to be*. Thus, *every independent being*, as it exiſts without a cauſe, is *neceſſarily* exiſting; becauſe exiſtence is *eſſential* to ſuch a being; ſo that it never could *begin* to exiſt, and never can *ceaſe to be*: For to ſuppoſe a being to begin to exiſt, or to loſe its exiſtence, is to ſuppoſe a *change* from non-entity to entity, or *vice verſa*; and to ſuppoſe ſuch a change is to ſuppoſe a cauſe upon which that being depends. Every being, therefore, which is independent, *i. e.* which had no cauſe of it exiſtence, muſt exiſt *neceſſarily*, and cannot poſſibly have begun to exiſt in time paſt, or ceaſe to be in time future.

29[3] Only one neceſſ[arily] exiſtent [be]ing in [the] former ſenſe; and

Theſe two kinds of neceſſity as applied to exiſtence, though they have been often confounded, are in themſelves perfectly diſtinct: For though a being cannot be neceſſarily exiſtent in the *former* ſenſe without being ſo in the latter alſo; yet may it be neceſſarily exiſtent in the latter ſenſe without being ſo in the former. For any thing that we know to the contrary, there may be two or more beings exiſting *neceſſarily* in the latter ſenſe of the word *neceſſity*, i. e. with regard to *independence* and the *manner* of their own exiſtence: but in the former ſenſe of the word, *i. e.* in relation to *this ſyſtem*, there can be but *one neceſſarily* exiſtent being; for it is obvious that no more are neceſſary to account for the production of the *dependent* beings which we know to exiſt. To ſuppoſe the non-exiſtence of *all independent* beings, implies the non-exiſtence of all dependent beings, ourſelves and every thing elſe; but to ſuppoſe the non-exiſtence of all independent beings except *one*, involves in the ſuppoſition no ſuch abſurdity.

[2]9[4] though there be mo[re] than o[ne] in the [lat]ter, th[ey] would no go[ds t]o us.

Thus the phenomena of nature leads us, by the ſtricteſt reaſoning, to one firſt cauſe, which is ſufficient for their production; and therefore none but *one* firſt cauſe can in this ſenſe of the word be *neceſſary*: And though ſeveral mere *independent* beings might poſſibly exiſt, yet they would be no gods to us: they would have no relation to us demonſtrable by reaſon, nor we any thing to do with them. For if the ſuppoſition of their exiſtence were not requiſite to the production of this ſyſtem, which it obviouſly would not be, we could *perceive* no neceſſity for it at all; we could never diſcover it by our own faculties, and therefore it could be nothing to us. And tho' two or three ſuch beings ſhould exiſt, and act in the formation and government of their *reſpective* ſyſtems, or *agree in one*; yet till their exiſtence and operations were made known to us, and a natural relation diſcovered, nothing would be due from us to them. They would have no *religious* or *moral* relations to us; and we ſhould have no reaſon to call more than one of them *our* creator, preſerver, and governor, which is the proper ſenſe of the word *God*.

To ſhow in this manner that there is only *one* eternal ſelf-exiſtent Being which bears the relation of *God to us*, ſeems to be going as far as is neceſſary, or as natural

tural light will lead us. Thoſe who endeavour to *demonſtrate* that there *cannot poſſibly* be *more than one* ſelf-exiſtent Being, either reaſon in a circle, or proceed upon principles which their antagoniſts cannot be compelled to grant. When they deduce the Divine unity from independence or omnipotence, they evidently preſuppoſe it in their definition of theſe attributes: and when they infer it from the nature of ſpace and duration, which they conſider as modes of the ſelf-exiſtent Being, they take it for granted, that ſpace and duration have a real exiſtence, independent of us and our thoughts; and that the one is infinite and the other eternal, contrary to what has been already proved, we think, with the force of demonſtration. The celebrated Dr Clarke made much uſe of ſpace and duration in his attempt to demonſtrate that there can be but one ſelf-exiſtent Being; but he argues for the ſame thing from the nature of neceſſity as applied to exiſtence.

"Neceſſity (ſays he *), abſolute in itſelf, is *ſimple* and *uniform* and *univerſal*, without any poſſible *difference*, *difformity*, or *variety*, whatſoever: and all *variety* or *difference* of *exiſtence* muſt needs ariſe from ſome *external* cauſe, and be *dependent upon it*, and *proportionable* to the efficiency of that *cauſe*, whatſoever it be. *Abſolute neceſſity*, in which there can be *no variation* in *any kind* or *degree*, cannot be the *ground* of exiſtence of a *number* of Beings, however *ſimilar* and *agreeing*: becauſe, without any *other difference*, even *number* is itſelf a manifeſt *difformity* or *inequality* (if I may ſo ſpeak) of *efficiency* or *cauſality*."

Such is this great man's firſt argument from neceſſity, to prove that there cannot be more than one ſelf-exiſtent Being. But what is this *neceſſity* which proves ſo much? It is the ground of exiſtence (he ſays) of that which exiſts of itſelf; and if ſo, it muſt, in the order of nature, and in our conceptions, be antecedent to that being of whoſe exiſtence it is the ground. Concerning ſuch *a* principle, there are but three ſuppoſitions which can poſſibly be made; and all of them may be ſhown to be abſurd and contradictory. We may ſuppoſe either the *ſubſtance* itſelf, ſome *property* of that ſubſtance, or ſomething *extrinſic* to both, to be this *antecedent ground* of exiſtence prior in the order of nature to *the firſt cauſe*.

One would think, from the turn of the argument which here repreſents this antecedent neceſſity as *efficient* and *cauſal*, that it were conſidered as ſomething *extrinſic* to the firſt cauſe *. Indeed if the words have any meaning in them at all, or any *force* of argument, they muſt be ſo underſtood, juſt as we underſtand them of any external cauſe producing its effect. But as an *extrinſic* principle is abſurd in itſelf, and is beſides rejected by Dr Clarke, who ſays expreſsly, that "of the thing which derives not its being from any other thing, this *neceſſity* or ground of exiſtence muſt be *in* the thing itſelf," we need not ſay a word more of the laſt of theſe ſuppoſitions.

Let us then conſider the firſt; let us take the *ſubſtance* itſelf, and try whether *it* can be conceived as *prior* or *antecedent* to itſelf in our conceptions or in the order of nature. Surely we need not obſerve that nothing can be more abſurd or contradictory than ſuch a ſuppoſition. Dr Clarke himſelf repeatedly affirms, and it would be ſtrange indeed if he did not affirm, that no *being*, no *thing* whatever, can be conceived as in any reſpect prior to the firſt cauſe.

The only remaining ſuppoſition is, that ſome *attribute* or *property* of the ſelf-exiſtent Being may be conceived as in the order of nature *antecedent* to that being. But this, if poſſible, is more abſurd than either of the two preceding ſuppoſitions. An *attribute* is *attributed* to its *ſubject* as its ground or ſupport, and *not* the *ſubject* to its *attribute*. A *property*, in the very notion of it, is *proper* to the ſubſtance to which it belongs, and *ſubſequent* to it both in our conceptions and in the order of nature. An *antecedent* attribute, or *antecedent* property, is a ſoleciſm as great, and a contradiction as flat, as an *antecedent ſubſequent* or *ſubſequent antecedent*, underſtood in the ſame ſenſe and in the ſame ſyllogiſm. Every property or attribute, as ſuch, preſuppoſes its ſubject; and cannot otherwiſe be underſtood. This is a truth ſo obvious and ſo forcible, that it ſometimes extorts the aſſent even of thoſe who upon other occaſions labour to obſcure it. It is confeſſed by Dr Clarke ‡, that "the ſcholaſtic way of proving the *exiſtence* of the ſelf-exiſtent Being from the abſolute perfection of his nature, is ὕστερον πρότερον. For all or any perfections (ſays he) preſuppoſe exiſtence; which is a *petitio principii*." If therefore properties, modes, or attributes in God, be conſidered as perfections (and it is impoſſible to conſider them as any thing elſe), then, by this confeſſion of the great author himſelf, they muſt all or any of them *preſuppoſe* exiſtence. It is indeed immediately added in the ſame place, "that bare neceſſity of exiſtence does not preſuppoſe, but infer exiſtence;" which is true only if ſuch neceſſity be ſuppoſed to be a principle *extrinſic*, the abſurdity of which has been already ſhown, and is indeed univerſally confeſſed. If it be a *mode* or *property*, it muſt *preſuppoſe* the exiſtence of its ſubject, as certainly and as evidently as it is a *mode* or a *property*. It might perhaps *à poſteriori* infer the exiſtence of its ſubject, as effects may infer a cauſe; but that it ſhould infer in the other way *à priori* is altogether as impoſſible as that a *triangle* ſhould be a *ſquare*, or a *globe* a *parallelogram*.

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‡ Anſwer to the Sixth Letter.

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A ſecond demonſtration of the ſame author.

Doubtful, as it would ſeem, of the force of his firſt argument, which even thoſe who pretend to be convinced by it acknowledge to be obſcure, the Doctor gives a ſecond, which we muſt confeſs appears to us to be ſtill more obſcure, and if poſſible leſs concluſive. "To ſuppoſe two or more *diſtinct beings* exiſting *of themſelves* neceſſarily and *independent* of each other, implies (he ſays) this *contradiction*, that *each* of them being independent from the other, they may either of them be ſuppoſed to exiſt *alone*; ſo that it will be no contradiction to ſuppoſe the other not to exiſt; and conſequently *neither of them* will be neceſſarily exiſting. Whatſoever therefore exiſts neceſſarily is the one ſimple eſſence of the ſelf-exiſtent Being; and whatſoever differs from that is not neceſſarily exiſting, becauſe in abſolute neceſſity there can be no *difference* or *diverſity* of exiſtence.

"Neceſſity is uſed here in two different ſenſes ‡, both as *abſolute* and *relative*. In the former, neither of the two beings can exiſt without the other, *i. e.* without our ſuppoſing the other to exiſt alſo, ſince that is equally neceſſary. In the latter, either of them may exiſt

‡ Law's Inquiry into the Ideas of Space, &c. chap. 6.

exist alone, *i. e.* without the help of the other, or without the supposition of the other as requisite to its own existence. The consequence therefore that either of them may exist alone, and so neither of them is necessary, is a mere *equivocation* on *necessity*, using it both in an absolute and relative sense at the same time." But as this is a question of the highest importance, and as the author was a man of great worth, we shall consider his argument upon the supposition that the word *necessity* has from the beginning to the end of it the same invariable meaning.

299 examined, and shown to be equally inconclusive.

It has been already observed, that there are only two senses in which that word can be applied to the existence of any being; and whether it be here used in the one or the other of these senses, the reasoning, if resolved into a syllogism, will appear to be inconclusive. If the word be taken in that sense of necessity which arises from the relation that dependent beings which we know to exist bear to some one independent Being, the argument will stand thus:

> From a known effect no more causes can be *necessarily* inferred than what are sufficient to account for that effect: but
>
> *One* self-existent and independent Being is sufficient to account for all the phenomena of nature; therefore, from the phenomena, &c.
>
> *No more* than *one* such Being can be *necessarily* inferred to exist.

But though no more than *one* independent being can in this sense of the word *necessarily* exist, it by no means follows from this syllogism, that two or more such beings may not *possibly* exist. It is, indeed, a plain contradiction to say, that two or more self-existent beings are in this sense *necessary;* but surely there is no contradiction in saying, that two or twenty such beings are *possible.* We could not, therefore, by this argument, convict a person of absurdity, who should affirm that two or more independent beings *actually* exist. We might, indeed, deny the existence of them all but *one*, because one is sufficient to account for those phenomena, from which alone we know that *any* independent being exists; but because one of them might be supposed to exist *alone*, so that it would be no contradiction to suppose the other not to exist; we know not how the Doctor came to affirm, in direct opposition to his own demonstration, that *not one* of them would be necessarily-existing.

Necessity, as applied to existence, in the other sense of the word, arises, as we have seen, from the relation which the *actual* existence of the being, of which it may be affirmed, has to the *manner* of that being's existence. It is the same necessity, we are told *, with that which is the *cause* of the unalterable proportion between two and four; and it is considered as the *formal* cause or *ground* of the existence of an independent being. Were it not for the strange expressions *formal cause* and *ground* of *existence*, we should have no objection to this account of that *necessity* by which a being independent undoubtedly exists: but this kind of necessity is a principle which will not support the superstructure which the learned author labours to raise upon it The same *necessity* which is the cause of the unalterable proportion between *two* and *four*, is likewise the cause of the unalterable proportion between *three* and *six*, between *four* and *eight*, and between *five* and *ten*, &c. But if it can be the cause of so many different proportions of the same kind, why may it not be the *formal cause* or *ground* of existence to as *many independent beings* of the same kind as well as to *one?* The following syllogism, we apprehend, to be legitimate both in mode and figure, and its conclusion is directly contrary to the proposition which the Doctor deduces from the same notion of necessity.

* *Answer to the Sixth Letter*, from a Gentleman in Gloucestershire.

> If necessity, considered as a *formal cause* or *ground* of *existence*, be in *one instance* of its causality the formal cause or ground of existence to *many things* of the same kind, it *may* likewise in *every other instance* of its causality, be the formal cause or ground of existence to many things of the same kind.
>
> But such necessity, in that instance of its causality where it is the formal cause or ground of existence to the unalterable proportion between two and four, *is* the formal cause or ground of existence to *many proportions* of the same kind.
>
> Therefore, the same necessity in that other instance of its casuality, where it is said to be the formal cause or ground of existence to *one* independent being, undoubtedly *may be* the formal cause or ground of existence to *many independent beings* of the same kind.

300 Necessity a dangerous principle.

Thus it appears, that *necessity*, in any sense in which it can be properly affirmed of existence, cannot be the foundation of any argument to prove the impossibility of more than one self-existent being. It is indeed a principle from which we apprehend that no positive conclusion whatever can be deduced by reasoning *à priori.* That necessity of existence may be predicated of a being which is independent and uncreated, is self-evident; because to the *nature* of such a being existence is essential. But whilst *that nature* itself remains wholly *incomprehensible* by us, it is impossible that we should discover, by our own unassisted reason, whether it can be the nature of *only one* or of *more than one* independent being. To argue from necessity, as if it were the cause or ground of existence to such a being, is certainly absurd, if it be not impious; for if that to which existence is essential, does not exist without any cause efficient or formal, we shall be obliged to inquire after a cause or ground of this cause, and thus be involved in all the absurdities and contradictions of an infinite series. We have insisted the longer on this point, because *necessity*, as the foundation of the argument *à priori*, has sometimes been employed to very bad purposes. Attempts have been made from the notion of *necessary* existence, to prove that the Supreme Being cannot be a free agent, and to set the first principles of the religion of nature at variance with those which are revealed in the scriptures.

301 The unity of God highly probable.

But though we are firmly persuaded that the divine unity cannot be *demonstrated à priori*, we are far from thinking it incapable of any *proof.* On the contrary, the common arguments *à posteriori* drawn from the *order* and *harmony* of the world, have always satisfied us, and in our opinion must satisfy every person capable of proportioning his assent to evidence, that the Creator and Preserver of such a system has but *one will* and *one intelligence*, and therefore is himself but *one being*. But *proof* is one thing; and *demonstration* is, in the proper sense of the word, another.

ther (G). And if we cannot arrive at *absolute* certainty concerning this important truth by the light of nature, we ought to be the more thankful for that revelation, which has put the unity of God past disputes to all who believe the holy scriptures.

The being which is self-existent and independent must be also *omnipotent*. That such a being has *active power in some degree*, is shown at the same time and by the same medium that we prove his existence; and since he depends upon no cause for his existence or his power, he cannot depend upon any for the exertion of that power, and consequently no *limits* can be applied to it. Limitation is an *effect* of some *superior cause*, which in the present instance there cannot be: consequently to suppose *limits* where there can be no *limiter*, is to suppose an *effect* without a *cause*. For a being to be *limited* or *deficient* in any respect †, is to be *dependent* in that respect on some *other* being which gave it just so much and no more; consequently that being which in *no respect* depends upon any other is in *no respect* limited or deficient. In all beings capable of increase or diminution, and consequently incapable of *perfection* or *absolute infinity*, *limitation* or *defect* is indeed a necessary consequence of existence, and is only a *negation* of that perfection which is wholly incompatible with their nature; and therefore in these beings it requires no further cause. But in a being *naturally capable* of *perfection* or absolute *infinity*, all *imperfection* or *finiteness*, as it cannot flow from the *nature* of that being, seems to require some *ground* or *reason*; which reason, as it is foreign from the being itself, must be the effect of some other external cause, and consequently cannot have place in the *first cause*. That the self-existent being is *capable* of perfection or absolute infinity must be granted, because he is manifestly the subject of one infinite or perfect attribute, viz. *eternity*, or absolute invariable existence. In this respect his existence has been shown to be perfect, and therefore it *may* be perfect in every other respect also. Now that which is the subject of one infinite attribute or perfection, must have all its attributes infinitely or in perfection; since to have any perfections in a finite limited manner, when the subject and these perfections are both *capable* of strict *infinity*, would be the forementioned absurdity of positive limitation without a cause. To suppose this eternal and independent being limited *in* or *by* its own *nature*, is to suppose some *antecedent nature* or *limiting quality* superior to that being, to the existence of which no *thing*, no *quality*, is in any respect *antecedent* or *superior*. And to suppose that there is no such thing as *active power* in a being which is evidently the fountain of all power, is the grossest of all absurdities. The same method of reasoning will prove knowledge and every other perfection to be *infinite* in the Deity, when once we have proved that perfection to belong to him at all; at least it will show, that to suppose it limited is unreasonable, since we can find no manner of *ground* for limitation in any respect; and this is as far as we need go, or perhaps as natural light will lead us.

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Omnipotence can do every thing which does not imply a contradiction.

Of the omnipotence of the supreme Being some philosophers, as well theists as atheists, have talked very absurdly. *Hobbes* ‖, with a view to make this attribute appear impossible and ridiculous, affirms "that God by his omnipotence or infinite power could turn a tree into a syllogism." And *Des Cartes* *, though certainly no atheist, childishly asserts, that all things whatever, even abstract truth and falsehood, do so depend upon the arbitrary will and power of God, as that if he had pleased "twice two should not have been four, nor the three angles of a plain triangle equal to two right ones." But the true notion of Omnipotence, so far from implying a power to turn a tree into a syllogism, or to make twice two not equal to four, implies only that the being possessed of it can actually perform whatever can be conceived by the most perfect understanding; conception in this case being the measure of possibility. Now every thing may be conceived by a mind sufficiently enlarged which does not involve in it a direct contradiction; but what we clearly discern to imply a contradiction, such as that a thing may be and not be at the same instant, cannot be conceived by any intellect, or made to exist by any power. And thus has this attribute of the Divinity been always stated, not only by the wiser Christians, but also by most of the ancient philosophers themselves, who expressly admit that "nothing is exempted from the divine power, but only to make that which hath been done to be undone." (H)

‖ *Leviath.* chap. 3.

* *Respons. ad Objectiones Sextas*, § 6.

And here it may be asked, Whether creation, in the

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(G) John Gerhard and John Vossius both cite *Gabriel Biel* as acknowledging the unity of God to be incapable of rigid demonstration; and with the sentiments of that schoolman, those two learned divines profess their own to agree.

Sed Biel (*1. Sent.* Dist. 2 Q. 10. Art. 3.), statuit "quod tantum *unum* esse Deum, sit *creditum* et *non-demonstratum* ratione naturali nobis in via possibili." Id nos ita interpretamur; etiamsi ex *naturæ libro* rationes *non contemnendæ* pro *unitate* divinæ essentiæ asserenda erui possint, eas tamen ad fidei πληροφορίαν cordibus nostris ingenerandam, non satis efficaces esse. Ergo mens prius confirmanda est ex *verbo Dei*, et illustribus testimoniis in quibus se Deus generi humano patefecit: Postea utiliter potest addi consideratio philosophicarum demonstrationum. *Gerhard. Loc. Comm. Tom. I.* p. 106.

Dissentit *Gabriel Biel*, qui ante annos hosce 140 *Tubingensi* Gymnasio præfuit. Is censet *probabiles* magis rationes esse quam *evidentes* et *certas*.—Verum esto sane, ut solæ non sint ἀποδεικτικαί: At magnum iis pondus addit *traditio* vetus; tum autem quod argumenta illhæc, si non prorsus ἀποδεικτικά, saltem usque adeo *probabilia* sint, ut τῆς πολυθεΐας patroni nihil ullius momenti adferre valeant; cur plusquam unum statuere deum potius conveniat. *Voss. de Idolatria, Lib.* 1. c. 2

(H) τὸ δὲ γεγονὸς οὐκ ἐνδέχεται μὴ γενέσθαι· διὸ ὀρθῶς Ἀγάθων·
Μόνου γὰρ αὐτοῦ καὶ θεὸς στερίσκεται,
Ἀγένητα ποιεῖν, ἅσσ᾽ ἂν ᾖ πεπραγμένα. *Arist. ad Nicomach.* Lib 6. cap. 2.

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the proper ſenſe of the word (ſee CREATION), be within the compaſs of infinite power. All the ancient philoſophers, who were unenlightened by the rays of divine revelation, held that it is not †; grounding their opinion upon this maxim, *Ex nihilo nihil fit*. But the maxim will ſupport no ſuch concluſion.—The ancients, or at leaſt the Peripatetic ſchool, with the metaphyſics of which we are beſt acquainted, conſidered four kinds of cauſes, the *efficient*, the *material*, the *formal*, and the *final*; and though they extended the maxim to the firſt *two*, if not to all theſe cauſes, it is a ſelf-evident truth only when applied to the *efficient cauſe*. Without the actual exertion of *power*, it is indeed moſt certain that nothing could be brought into exiſtence; but it is ſo far from being clear that pre-exiſtent matter, or, as Ariſtotle choſe to expreſs himſelf, a *material cauſe*, muſt be ſuppoſed for infinite power to operate upon, that, we think, every man may find complete evidence of the contrary in himſelf. That ſenſation, intelligence, conſciouſneſs, and volition, are not the reſult of any modifications of figure and motion, is a truth as evident as that conſciouſneſs is not ſwift, nor volition ſquare. If then theſe be the powers or properties of a being diſtinct from matter, which we think capable of the completeſt proof, every man who does not believe that his mind has exiſted and been conſcious from eternity, muſt be convinced that the power of creation has been exerted in himſelf. If it be denied that there is any immaterial *ſubſtance* in man, ſtill it muſt be confeſſed, that, as matter is not eſſentially conſcious, and cannot be made ſo by any particular organization, there is ſome real *thing* or *entity*, call it what you pleaſe, which has either exiſted and been conſcious from eternity, or been in time brought from non-entity into exiſtence by an exertion of infinite power.

304 Creation poſſible to Omnipotence.

† See *Moſheim's Diſſertation on this Subject, in his Edition on Cudworth's Intellectual Syſtem.*

To this perhaps ſome one may object, that upon our own ſuppoſition of the inability of the human mind to exert its faculties but in union with ſome material and organiſed ſyſtem, the mind of every man may have exiſted from eternity without being conſcious of its own exiſtence; and that, therefore, we have in ourſelves no evidence of *creation*, but only of the union of two ſelf-exiſtent ſubſtances, which in their prior ſtate had been diſtinct and ſeparate from each other. But ſuch an objection as this, we beg leave to reply, can ariſe from nothing but miſapprehenſion of our hypotheſis, and of the reaſons by which we think it ſupported. We ſuppoſe, that to the exertion of the human faculties, a body of ſome kind or other may be neceſſary as an inſtrument, not merely from what we obſerve of the dependence of perception and memory on the ſtate of the brain, but becauſe we cannot conceive a Creator of infinite wiſdom and goodneſs to immerſe in ſyſtems of matter, minds to which he knows that ſuch ſyſtems muſt be always uſeleſs and often hurtful. We believe, therefore, that our ſouls and bodies were created and formed for each other; but as our preſent adverſaries admit not of a Creator, we muſt aſk them, How their ſelf-exiſtent ſouls have been diſpoſed of from eternity, and by what power they have all in due ſucceſſion been united each to its proper body? As before the union they were not conſcious, they could not unite themſelves; and to ſuppoſe them united by ſome ſuperior intelligence, is to ſuppoſe them in ſome reſpects dependent on that intelligence, which ſeems not to accord with their ſelf-exiſtence. Whatever is ſelf-exiſtent and eternal muſt be independent; and if poſſeſſed of any power, cannot be conceived to have that power limited.—We repeat, therefore, that every man has in himſelf ſufficient evidence that creation is poſſible; for if infinite power can create an immaterial and percipient being, it may ſurely be ſuppoſed capable of creating dead and unintelligent matter.

But the creation of the material ſyſtem may be ſhown to be in the higheſt degree probable by other arguments. The ſame reaſoning which proves the impoſſibility of an infinite ſeries and of eternal time, proves that the univerſe cannot have exiſted from eternity in its preſent ſtate. But if it has not exiſted from eternity in its preſent ſtate, it belongs to the opponents of creation to ſay what was its former. We talk indeed of *chaos*; but ſuch language, when a Creator is not admitted, is moſt unphiloſophical trifling. It appears from the moſt accurate inquiries that have been made into the ſubſtance and eſſence of body ‡, that the atoms of which each maſs is compoſed are held together by a foreign force. If by chaos be meant matter, when this force is ſuppoſed to be removed, we muſt beg leave to ſay, that of ſuch a ſubſtance we have neither idea nor notion, and cannot diſtinguiſh it from non-entity. The original atoms of matter, we believe indeed to require no other agency to keep each entire than that *fiat* by which it was created; but ſtill, as thoſe atoms are conceived to be ſolid and extended, they muſt be capable of diviſion by infinite power; and if that *fiat* or influence which makes them ſolid and extended were removed, they would loſe ſolidity and extenſion, and of courſe become nothing. So far is it, therefore, from being true, that the creation of matter appears to be impoſſible, that we are compelled by every thing that we know of it to believe that matter cannot poſſibly be ſelf-exiſtent.

‡ Baxter's *Inquiry into the Nature of the Human Soul*.

"Becauſe it is undeniably certain, concerning ourſelves (ſays Cudworth †), and all imperfect beings, that none of theſe can create any *new ſubſtance*, men are apt to meaſure all things by their own ſcantling, and to ſuppoſe it univerſally impoſſible for any power whatever thus to create. But ſince it is certain, that imperfect beings can themſelves produce *ſome things* out of nothing pre-exiſting, as *new cogitations*, *new local motion*, and *new modifications* of things corporeal, it is ſurely reaſonable to think that an abſolutely perfect Being can do *ſomething more*, *i.e.* create *new ſubſtances*, or give them their whole being. And it may well be thought as eaſy for God or an Omnipotent Being, to make a whole world, matter and all, ἐξ οὐκ ὄντων, as it is for us to create *a thought* or to move a finger, or for the ſun to ſend out rays, or a candle light; or laſtly, for an opaque body to produce an image of itſelf in a glaſs or water, or to project a ſhadow: all theſe imperfect things being but the *energies*, *rays*, *images*, or *ſhadows*, of the Deity. For a ſubſtance to be made out of nothing by *God*, or a *Being infinitely perfect*, is not for it to be made out of nothing in the impoſſible ſenſe, becauſe it comes from him who is *all*. Nor can it be ſaid to be impoſſible for any thing whatever to be made by that which hath.

† *Intellectual Syſtem*, Book … Chap. …

hath not only *infinitely greater perfection*, but also *infinite active power*. It is indeed true, that infinite power itself cannot do things in their own nature impossible; and, therefore, those who deny creation, ought to prove, that it is absolutely impossible for a *substance*, though not for an *accident* or *modification*, to be brought from non-existence into *being*. But nothing is in itself impossible, which does not imply a contradiction: and though it be a contradiction for a thing to be and not to be at the same time, there is surely no contradiction in conceiving an imperfect being, which before was not, afterwards to be." To call in question the possibility of creation, because we have no *adequate conception* how a thing can be brought into existence, would be in the highest degree absurd; for it may be doubted, whether we have *adequate* conceptions of any thing except our own ideas and their various relations (1).

305 The Being which is self-existent, omnipotent, and omniscient, is not a *necessary*, but a *free* agent; for *active power* implies *freedom*, and *infinite* power *infinite* freedom. What, therefore, hath no bounds set to its power, what can have no opposition made to its will, nor restraint laid on its actions, must both will and act freely. "If the supreme cause were not a being endowed with liberty and choice, but a mere necessary agent, then would it follow, as Dr Clarke well observes †, that nothing which is not, could *possibly* have been; and that nothing which is, could *possibly* not have been; and that no mode or circumstance of the existence of any thing could *possibly* have been in any respect otherwise than it now actually is. All which being evidently most false and absurd; it follows, on the contrary, that the supreme cause is not a mere necessary agent, but a Being endued with liberty and choice."

To this reasoning it has been lately replied †, that "Clarke must have known, that all those who contend against the free agency of the Deity, do of course acknowledge, that nothing could have happened, or does happen, or will happen, but what actually has happened, or doth happen, or will happen; and that it is most false and absurd to deny it." It is, therefore, according to the necessarians, absolutely impossible, that at present there could exist upon this earth more or fewer persons than are now actually alive; that the earth could move in any other direction than from west to east; or that there could be more or fewer planets in the solar system. Yet is it most certain, that there *have been fewer persons* on the earth than there are now; that there is not a cultivated country in Europe which could not contain *more* people than now inhabit it; that the comets move in very different directions from that of west to east; and that as, till very lately, we *conceived* only six primary planets in the system, it is evidently *possible* that the system *might contain* no more. Upon the supposition, therefore, that the Supreme Being acts under a physical necessity, the same things are possible and not possible at the same time, which is the grossest of all absurdities. It might have been objected with much more plausibility, that the first cause cannot possibly be free, because he must needs do always what is best in the whole; but it will be seen by and by, that among different created systems, there is no reason for supposing any one absolutely *best*.

306 But though this Being is *free*, and as such the author of *change* in other beings, yet he must himself be *unchangeable*; for all changes have a beginning, and consequently are effects of some *prior causes*. But there can be nothing prior to the existence of this Being, as he is *eternal*; neither any *cause* of it, as he is *independent*; nor consequently any *change* in it, except we could suppose him to *change himself*, which is the same absurdity as to *produce* himself, *i. e.* to be at *the same time both effect* and *cause*.

307 Omniscience, as well as some of the foregoing attributes of the Supreme Being, may perhaps be more easily deduced thus §. We find in ourselves such qualities as *thought* and *intelligence*, *power* and *freedom*, &c. for which we have the evidence of consciousness as much as for our own existence. Indeed, it is only by our consciousness of these that our existence is known to ourselves. We know likewise that these are *perfections*, and that to have them is better than to be without them. We find also that they have not been in us from eternity. They must, therefore, have had a *beginning*, and consequently some *cause*, for the very same reason that a *being* beginning to exist in time requires a cause. Now this cause, as it must be *superior* to its *effect*, must have those perfections in a *superior* degree; and if it be the *first cause*, it must have them in an *infinite* or *unlimited* degree, since *bounds*, or *limitation* without a limiter, would, as we have already shown, be an *effect* without a *cause*.

It is indeed obvious, that the *omniscience* of the Supreme Being is implied in his very existence. "For all things being not only present to him, but also entirely

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Himself unchangeable.

Omniscience, &c. proved in a different manner.

§ *Notes to King on Evil.*

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(1) "Ridicula foret et inepta ejus temeritas, qui corporum ideo creationem sibi duceret negandum esse, quod ejus creationis *clarem et perspicuam notionem* effingere cogitatione nobis haud licet. Infinita enim est rerum copia, quarum perspicuis et apertis caremus notionibus. Et si omnia neganda continuo nobis essent, quorum confusam tantum et imperfectam consequi possumus notionem, omnia fere nobis essent neganda, exceptis *relationibus*, quas inter notiones quasdam abstractas esse intelligimus. Quis interiorem sibi naturam rerum, tam corporum, quam spirituum, cognitam esse dixerit? Et esse tamen has naturas, omni plane dubitatione vacat. Quis quemadmodum altera harum naturarum agat in alteram, sese scire, affirmet? Quis causas sibi patere, propter quas hi vel illi effectus, quos videmus quotidie contingere, a certis veniant corporibus, jure glorietur? Nec tamen quisquam est, qui vel illam animæ in corpus operationem, vel hos effectus in dubium revocare ausit. Teneamus igitur ea, quæ certo novimus, nec idcirco nos ab illis dimoveri patiamur, quod multa rursus sunt, quorum naturam ignoramus; contra multa nos fugere et cognitionem nostram superare, æquo et tranquillo feramus animo. *Joannis Clerici contra eos qui negant, ex nihilo ulla ratione fieri posse aliquid, observationes; in Moshemii edit. Intellec. Syst.*

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tirely *depending* upon him, and having *received* both their *being* itſelf and all their powers and faculties *from him*, it is manifeſt that as he knows all things that are, and penetrates every part of their ſubſtance with his all-ſeeing eye, ſo muſt he likewiſe know *all poſſibilities* of things, that is, all effects that *can be*. For, being alone ſelf-exiſtent, and having alone given to all things all the powers and faculties with which they are endued, it is evident that he muſt of neceſſity know perfectly what all and each of theſe powers and faculties, *which are derived wholly from himſelf*, can poſſibly produce. And ſeeing at one boundleſs view, or more properly in his own ideas, all the poſſible compoſitions and diviſions, variations and changes, circumſtances and dependencies of things, all their poſſible relations one to another, and their diſpoſitions or fitneſſes to certain and reſpective ends, he muſt without poſſibility of error know exactly what is beſt and propereſt in every one of the numberleſs poſſible caſes, or methods of diſpoſing things; and underſtand perfectly how to order and direct the reſpective means to bring about what he ſo knows to be in its kind, or on the whole, the beſt and fitteſt in the end. This is what is meant by infinite wiſdom, or omniſcience †;" and it has been readily admitted by every man who has believed in the exiſtence of a God as the creator and preſerver of all things.

† *Clarke's Demonſtration, &c.*

308 God foreknows the actions of free agents.

Doubts, however, have been entertained by theiſts, and pious theiſts, whether omniſcience itſelf can certainly foreknow what are called contingent events, ſuch as the actions of free agents; and ſome few there are profeſſing to be even Chriſtians, who have boldly pronounced ſuch knowledge to be impoſſible. That we have no adequate notion *how* events, which are called contingent, can be certainly foreknown, muſt indeed be granted; but we are not, therefore, authoriſed to ſay that ſuch knowledge is impoſſible, unleſs it can be clearly ſhown to imply a contradiction. They who ſuppoſe that it implies a contradiction, muſt likewiſe ſuppoſe, that, where there is not a chain of neceſſary cauſes, there can be no certainty of any future event; but this is evidently a miſtake. "For let us ſuppoſe that there is in man a power of beginning motion, and of acting with what has of late been called *philoſophical* freedom; and let us ſuppoſe farther that the actions of ſuch a man cannot poſſibly be foreknown; will there not yet be in the nature of things, notwithſtanding this ſuppoſition, the ſame *certainty of event* in every one of the man's actions, as if they were ever ſo fatal and neceſſary? For inſtance, ſuppoſe the man, by an internal principle of motion, and an abſolute freedom of mind, to do ſome particular action *to-day*, and ſuppoſe it was not poſſible that this action ſhould have been foreſeen *yeſterday*, was there not nevertheleſs the ſame *certainty of event* as if it had been foreſeen, and abſolutely neceſſary? That is, would it not have been as *certain a truth* yeſterday, and from eternity, that this action was in event *to be performed to-day*, notwithſtanding the ſuppoſed freedom, as it is now a *certain and infallible truth* that it is performed? Mere *certainty of event*, therefore, does not in any meaſure imply *neceſſity* †." And ſurely it implies no contradiction to ſuppoſe, that every future event which in the nature of things is *now certain*, may *now be certainly known* by that intelligence which is omniſcient. The *manner* how God can foreknow future events, without a *chain of neceſſary cauſes*, it is indeed impoſſible for us to explain: yet ſome ſort of *general notion* of it we may conceive. "For, as a man who has no influence over another perſon's actions, can yet often perceive beforehand what that other will do; and a wiſer and more experienced man, with ſtill *greater probability* will foreſee what another, with whoſe diſpoſition he is perfectly acquainted, will in certain circumſtances do; and an angel, with ſtill *leſs degrees of error*, may have a further proſpect into mens future actions: ſo it is very reaſonable to conceive, that God, without influencing mens wills by his power, or ſubjecting them to a chain of neceſſary cauſes, cannot but have a knowledge of future free events, as much *more certain* than men or angels can poſſibly have, as the *perfection* of *his* nature is greater than that of *theirs*. *The diſtinct manner how* he foreſees theſe things we cannot, indeed, explain; but neither can we explain the *manner* of numberleſs other things, of the reality of which, however, no man entertains a doubt †." We muſt therefore admit, ſo long as we perceive no contradiction in it, that God always knows all the free actions of men, and all other beings endued with liberty; otherwiſe he would know many things now of which he was once ignorant, and conſequently his *omniſcience* would receive addition from events, which has been already ſhown to be contrary to the true notion of infinity.—In a being incapable of change, knowledge has nothing to do with *before* or *after*. To every purpoſe of knowledge and power, all things are to him equally preſent. He knows perfectly every thing that is, and what to us is future he knows in the very ſame manner as he knows what to us is preſent.

† *Clarke's Demonſtration, &c.*

309 God infinitely perfect, all-ſufficient and omnipreſent.

Thus have we demonſtrated the neceſſary exiſtence of a being who is *eternal, independent, unchangeable, omnipotent, free in his actions*, and *omniſcient*; and this is the being whom we worſhip as God. *Eternity, independence, immutability, omnipotence, liberty*, and *omniſcience*, which ſeem to be all the *natural* attributes which we can diſcover in the divine nature, as they are conceived to be differently combined, make us ſpeak of him in different terms. His enjoying in an abſolute manner every conceiveable power or perfection, makes us call him a Being *infinitely perfect*. His being capable of no want, defect, or unhappineſs of any kind, denotes him to be *all-ſufficient in himſelf*; and the unlimited exerciſe of his knowledge and power, demonſtrates him to be *omnipreſent*. That ſuch a Being muſt be incomprehenſible by us, and by every creature, is a truth ſelf-evident; and yet in all ages men of the beſt intentions have been vainly attempting this impoſſibility. The manner of his omniſcience, for inſtance, has been the ſubject of much diſputation among thoſe who ought to have reflected that they knew not how their own minds were preſent to their own bodies.—The celebrated Dr Clarke and his adherents, who conſidered ſpace as the *ſine qua non* of all other things, inſiſted, that God muſt be infinitely extended; and that, as wherever his ſubſtance is, there his attributes muſt be, it is thus that his knowledge and power are preſent with every creature. But this notion labours under inſuperable difficulties.

For "if the Divine ſubſtance be infinitely extended, then will there be part of it in this place and part in in that. It muſt be commenſurate with all particular beings, ſo that ſome will occupy more and ſome leſs of its dimenſions. By this account it will be very proper and philoſophical to ſay, that God is not in *heaven*, but only a *part* of him; and that an *elephant* or a *mountain*, a *whale* or a wicked *giant*, have more of the eſſence or preſence of God with them than the *holieſt* or *beſt* man in the world, unleſs he be of equal ſize: all which, as has been well obſerved †, are at leaſt harſh and grating expreſſions. As the attributes of the Divine Being muſt be conſidered in the ſame manner with his ſubſtance, we ſhall likewiſe, upon this notion of omnipreſence, have a part of his knowledge and power in this place, and a part of them in that; and of theſe parts the one muſt be greater or leſs than the other according to the dimenſions of the place with which it is commenſurate; which is a ſuppoſition that appears to us harſher, if poſſible, than even the former.

"Should it be ſaid that the Divine attributes are not to be conſidered as having parts (though we ſee not how they can be conſidered otherwiſe than as their ſubject), they muſt then exiſt *completely* in every point of this immenſe expanſion. Be it ſo; and what follows? Why, every point of this infinitely expanded being will be omniſcient and omnipotent by itſelf; an inch of it will have as much wiſdom and power as a yard, a mile, or the whole; and, inſtead of one infinite wiſdom and power, we ſhall have millions: For as theſe parts of the ſubſtance are conceived *diſtinctly*, and one individual part is not another, ſo muſt the attributes be likewiſe conceived, and the individual power and knowledge of one part be diſtinct from that of another." And if ſo, it follows, that one point of this expanded being has equal power and intelligence with the whole; ſo that the notion of extenſion being *neceſſary* to God's preſence with every creature, involves in it the moſt palpable contradiction. That God is at all times and in all places ſo preſent with every creature as to have an abſolute knowledge of and power over it, is indeed capable of the ſtricteſt demonſtration; but we think it great preſumption to aſſign the particular *mode* of his preſence, eſpecially ſuch a one as is neither agreeable to the nature of an abſolutely perfect Being, nor in the leaſt neceſſary to the exerciſe of any one perfection which he can be proved to poſſeſs. Philoſophers and divines have offered ſeveral names for the manner in which God is preſent with his works; but we chooſe rather to confeſs, that the *manner* of his preſence is to us, and probably to every creature, wholly incomprehenſible. Nor need we be ſurpriſed or ſtaggered at this, when we reflect that the manner in which our own minds are preſent with our bodies is to us as incomprehenſible as the manner in which the ſupreme Mind is preſent with every thing in the univerſe. That our minds have a power over our limbs, we know by experience: but that they are not extended or ſubſtantially diffuſed through them, is certain; becauſe men daily loſe arms and legs without loſing any part of their underſtanding, or feeling their energies of volition in the ſmalleſt degree weakened. But we need purſue this ſubject no farther. It has been confeſſed by one of the moſt ſtrenuous advocates ‡ for the extenſion of the Deity and all minds, that "there is an incomprehenſibleneſs in the *manner* of every thing, about which no controverſy can or ought to be concerned."

The moral attributes of God may be deduced from his natural ones, and are immediate conſequences of them when exerciſed on other beings. They may be termed his *ſecondary relative* attributes, as they ſeem to be the perfection of his *external acts* rather than any *new internal* perfections. And though the exiſtence of any moral quality or action is not capable of ſtrict *demonſtration*, becauſe every moral action or quality, as ſuch, depends upon the *will* of the agent, which muſt be abſolutely free; yet we have as great aſſurance that there are moral qualities in God, and that he will always act according to theſe qualities, as the nature of the thing admits; and may be as well ſatisfied of it, as if it were capable of the moſt rigid demonſtration. This important point, however, cannot be ſo clearly or ſo firmly eſtabliſhed by abſtract reaſoning as by taking a ſcientific view of the works of creation, which evince the goodneſs, holineſs, and juſtice, of their Author, as well as his perfect wiſdom and infinite power. The conſideration, therefore, of the moral attributes of God, together with his providence, and the duties thence incumbent on man, is the proper buſineſs of other articles (ſee RELIGION, THEOLOGY, and MORAL *Philoſophy*.)

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311 God's moral attributes reſult from his natural perfections.

At preſent we ſhall only obſerve, that by reaſoning *à priori* from his exiſtence and his natural perfections, we muſt neceſſarily infer that his actions are the reſult of unmixed benevolence. Every wiſe agent has ſome end in view in all his actions; it being the very eſſence of folly to act for no end: but there cannot be an end of action which is not either ſelfiſh or benevolent. Selfiſhneſs is the offspring of want and imperfection, and is therefore the ſource of moſt *human* actions; becauſe men are weak and imperfect beings, capable of daily additions to their happineſs. When the thief plunders a houſe at midnight, when the highwayman robs a traveller on the road, and even when the aſſaſſin murders the man who never injured him; it will be found that their actions ſpring not from an innate deſire to inflict miſery upon others, but from a proſpect of reaping advantage to themſelves. The object of the thief and the robber is obvious: it is to gain money, which is the mean of procuring the comforts of life. Even the aſſaſſin has always the ſame ſelfiſh end in view: either he is *bribed* to commit the murder, or he fancies that his horrid deed will remove an *obſtacle* from the way to his own happineſs. But they are not vicious men *only* who act from ſelfiſh conſiderations: much of human *virtue*, when traced to its ſource, will be found to have its origin in the deſire of happineſs. When a man gives his money to feed the hungry and to clothe the naked, he believes that he is acting agreeably to the will of Him to whom he and the poor ſtand in the ſame relation; and he looks for a future and eternal reward. By continuing the practice, he ſoon acquires the habit of benevolence; after which, indeed, he looks for no further reward, when performing particular actions, than the immediate pleaſure of doing good. This ſelfiſhneſs of man is the neceſſary conſequence of his progreſſive ſtate. But the Being who is independent, omnipotent, omniſcient, and, in a word, poſſeſſed of every poſſible

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perfection, is incapable of progreſſion, or of having any acceſſion whatever made to his happineſs. He is immutable; and muſt of neceſſity have been as happy from eternity, when exiſting alone, as after the creation of ten thouſand worlds. When, therefore, he willed the exiſtence of other beings, he could have nothing in view but to communicate ſome reſemblance of his own perfections and happineſs. That he had *ſome* end in view, follows undeniably from his infinite wiſdom. That he could not have a *ſelfiſh* end, follows with equal certainty from his own infinite perfections; and as there is no medium, in the actions of a wiſe Being, between ſelfiſhneſs and benevolence, we muſt neceſſarily conclude, that the creation was the reſult of unmixed benevolence or perfect goodneſs. The other moral attributes of the Deity, his juſtice, mercy, and truth, ought therefore to be conſidered only as ſo many different views of the ſame *goodneſs* in the *Creator*, and various ſources of *happineſs* to the *creature*. Theſe are always *ſubordinate* to and *regulated* by this one principal perfection and brighteſt ray of the Divinity.

"Thus we conceive his *juſtice* to be exerted on any being no farther than his goodneſs neceſſarily requires, in order to make that being, or others, *ſenſible* of the *heinous nature* and *pernicious effects of ſin* §, and thereby to bring them to as great a degree of happineſs as their ſeveral natures are capable of. His *holineſs* hates and abhors all wickedneſs, only as its neceſſary conſequences are abſolute and unavoidable miſery; and his veracity or faithfulneſs ſeems to be concerned for truth, only becauſe it is connected with and productive of the happineſs of all rational beings; to provide the propereſt means for attaining which great end, is the exerciſe of his *wiſdom*." Such is the view of God's moral attributes, which the abſtract contemplation of his natural perfections neceſſarily gives; and whether this way of conceiving them be not attended with leſs difficulty than the common manner of treating them under the notion of two infinites *diametrically oppoſite*, muſt be left to the judgment of the reader.

§ *Notes to King on Evil.*

313 The origin of evil.

But if the Creator and ſupreme Governor of all things be a Being of infinite power, perfect wiſdom, and pure benevolence, how came evil into the works of creation? This is a queſtion which has employed the ſpeculative mind from the firſt dawning of philoſophy, and will continue to employ it till our faculties be enlarged in a future ſtate, when philoſophy ſhall give place to more perfect knowledge. To theſe meditations, as has been well obſerved ‡, humanity is not equal. Volumes have been written on the ſubject; but we believe that the following extract from Dr Clarke contains all that can be advanced with certainty, and all that is neceſſary to vindicate the ways of God to man.

‡ *Johnſon's Review of a free Inquiry into the Origin of Evil.*

"All that we call evil (ſays that able reaſoner †), is either an *evil of imperfection*, as the want of certain faculties and excellencies which other creatures have; or *natural evil*, as pain, death, and the like; or *moral evil*, as all kinds of vice. The *firſt* of theſe is not properly an evil: for every power, faculty, or perfection, which any creature enjoys, being the free gift of God, which he was no more obliged to beſtow than he was to confer being or exiſtence itſelf, it is plain, that the want of any certain faculty or perfection, in any kind of creatures, which never belonged to their nature, is no more an evil to them, than their never having been created or brought into being at all could properly be called an evil." To this we may add, that as no created being can be ſelf-exiſtent and independent, imperfection is unavoidable in the creation, ſo that the evil of defect (as it is moſt abſurdly called) muſt have been admitted, or nothing could ever have exiſted but God. "The *ſecond* kind of evil, which we call *natural* evil, is either a neceſſary conſequence of the former, as *death* to a creature on whoſe nature immortality was never conferred; and then it is no more properly an evil than the former: Or elſe it is counterpoiſed in the whole with as great or greater good, as the *afflictions and ſufferings of good men*; and then alſo it is properly no evil: Or elſe it is a *puniſhment*; and then it is a neceſſary conſequence of the *third* and laſt ſort of evil, viz. *moral evil*. And *this* ariſes wholly from the abuſe of *liberty*, which God gave to his creatures for other purpoſes, and which it was reaſonable and fit to give them for the perfection and order of the whole creation: only they, contrary to God's intention and command, have abuſed what was neceſſary for the perfection of the whole, to the corruption and depravation of themſelves. And thus have all ſorts of evils entered into the world without any diminution to the infinite goodneſs of its Creator and Governor."

† *Demonſtration of the Being and Attributes of God.*

31[4] Whether the present syſtem be the beſt poſſible.

But though evil could not be totally excluded from the univerſe, are we not authoriſed to infer, from the infinite power, wiſdom, and goodneſs of the Creator, that the preſent ſyſtem is upon the whole the very beſt ſyſtem poſſible? Undoubtedly we are, if of poſſible ſyſtems there *can be a beſt*; but this is ſo far from being evident, that we think it implies a contradiction. A beſt of beings there is, *viz.* God, who is poſſeſſed of infinite perfections; but there cannot be a beſt of creatures or of created ſyſtems. To prove this, we need only reflect, that wherever creation ſtops, it muſt ſtop infinitely ſhort of infinity; and that how perfect ſoever we conceive any creature or ſyſtem of creatures to be, yet the diſtance between that and God is not leſſened, but continues infinite. Hence it follows, that the nature of God and his omnipotence is ſuch, that whatever number of creatures he has made, he may ſtill add to that number; and that however good or perfect the ſyſtem may be on the whole, he might ſtill make others equally good and perfect.

31[5] Origin of that opinion.

The diſpute, whether a being of infinite power, wiſdom, and benevolence, muſt be ſuppoſed to have created the *beſt poſſible ſyſtem*, and the embarraſſment of mens underſtandings about it, ſeem to have ariſen from their taking the words *good*, *better*, and *beſt*, for abſolute qualities inherent in the nature of things, whereas in truth they are only relations ariſing from certain appetites. They have indeed a foundation, as all relations have, in ſomething abſolute, and denote the thing in which they are founded; but yet they themſelves imply nothing more than a relation of congruity between ſome appetite and its objects. This is evident; becauſe the ſame object when applied to an appetite to which it has a congruity, is good; and bad, when applied to an appetite to which it has no congruity. Thus, the earth and air to terreſtrial animals are good elements, and neceſſary to their preſervation: to thoſe animals the water is bad, which yet affords

affords the beſt receptacle to fiſhes. *Good*, therefore, being relative to appetite, that muſt be reckoned the beſt creature by us which has the ſtrongeſt appetites, and the ſureſt means of ſatisfying them all, and ſecuring its own permanent happineſs. And though the *ſubſtance* of creatures is chiefly to be regarded as contributing to their perfection, yet we have no way of meaſuring the perfection of different ſubſtances but by their qualities, *i. e.* by their appetites by which they are ſenſible of good and evil, and by their powers to procure thoſe objects from which they receive that ſenſe of things which makes them happy.

It is plain, therefore, that whatever ſyſtem we ſuppoſe in nature, God might have made another equal to it; his infinite wiſdom and power being able to make other creatures equal in every reſpect to any that we know or can conceive, and to give them equal or ſtronger appetites, and as certain or more certain ways of ſatisfying them. We ſee in many caſes, that very different means will anſwer the ſame end. A certain number of regular pyramids will fill a ſpace; and yet irregular ones will do it as well, if what we take from the one be added to another; and the ſame thing may be done by bodies of the moſt irregular and different figures in the ſame manner: and therefore we may very well conceive, that the anſwering of appetites, which is all the *natural good* that is in the world, may as well be obtained in another ſyſtem as in this; provided we ſuppoſe, that where the appetites of the ſentient beings are changed, the objects are alſo ſuited to them, and an equal congruity among the parts of the whole introduced. This is ſo eaſily conceived, that in an indefinite number of poſſible worlds, we do not ſee why it may not be done in numberleſs ways by infinite power and wiſdom.

If then it be plain, that there might have been many other worlds, or even but one, equal to this in all reſpects as to goodneſs, there could be no neceſſity, either phyſical or moral, that God ſhould create the one rather than the other; becauſe nothing could make the one better, or to him more agreeable, than the other, but his own free choice. Either, therefore, God muſt be poſſeſſed of abſolute freedom, or, among a number of poſſibilities equally perfect, he could not have made a choice, and ſo nothing would ever have been created. It is not, then, as Leibnitz and others argue, the natural and neceſſary goodneſs of ſome particular things, *repreſented by the divine ideas*, which determines God to prefer them to all others, if underſtood of his *firſt* act of producing them; but it is his own free choice, which among many equal *potential* goods, makes ſome things *actually* good, and determines them into exiſtence. When thoſe are once ſuppoſed to exiſt, every thing or action becomes good which tends to their happineſs and preſervation; and to ſuppoſe their all-perfect Author to have any other end in view than their preſervation and happineſs, is the ſame abſurdity as to ſuppoſe that knowledge may produce ignorance; power, weakneſs; or wiſdom folly.

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317 God not neceſſitated by his goodneſs to create the preſent in preference to all other worlds.

We have now finiſhed what we propoſed under the article Metaphyſics. It has ſwelled in our hands to a large extent; and yet it can be conſidered as little more than an introduction to that ſcience, which comprehends within its wide graſp every thing exiſting. The reader who wiſhes to purſue theſe intereſting ſpeculations, ſhould ſtudy diligently the authors whom we have conſulted, and to whom we have been careful to refer in the margin. Were we to make a ſelection, we ſhould without heſitation recommend Ariſtotle and Plato among the ancients; and Cudworth, Locke, Hartley, and Reid, among the moderns. Theſe philoſophers, indeed, on many points, differ exceedingly from one another; but he who wiſhes not to adopt opinions at random, ſhould know what can be ſaid on both ſides of every queſtion.

METAPLASMUS, in grammar, a tranſmutation or change made in a word, by adding, retrenching, or altering a ſyllable or letter thereof.

METAPONTUM, or METAPONTIUM, (anc. geog.), a town of Lucania, on the Sinus Tarentinus, to the weſt of Tarentum; built by the Pylians, who returned from Troy, (Mela). Where Pythagoras is ſaid to have taught in the time of Servius Tullius, (Livy). *Metapontini*, the people; who pretended to ſhow, in a temple of Minerva, the tools with which Epeus built the wooden horſe, (Juſtin). Now a tower, called *Torre di Mare*, in the Baſilicata of Naples, (Baudrand.)

METASTASIO (l' abbe Pierre Bonaventure), whoſe real name was *Trapaſſi*, was born at Aſſiſe, on January 3d, 1698. His talent for poetry was firſt unfolded by the reading of Taſſo; and he began to compoſe verſes at ten years of age. "A prodigy of this nature (ſays Metaſtaſio) made ſuch an impreſſion on my maſter, the celebrated Gravina, that he thenceforth conſidered me as a plant worthy of being cultivated by his own hands." Metaſtaſio was only fourteen years of age when he compoſed his tragedy entitled *Il Giuſtino*; in which he appears too cloſe and ſcrupulous an imitator of the Grecian drama. Our young poet unfortunately loſt his patron in 1717; who left him his heir, "as being a young man of the moſt promiſing abilities." Metaſtaſio, at the age of nineteen, being, in conſequence of this inheritance, ſuperior to thoſe wants which repreſs the exertions of genius, and to which men of abilities are too often ſubject, gave full ſcope to his inclination for poetry. He began his dramatic career with the *Didonne Abandonnata*, which was acted at Naples in 1724: the muſic was compoſed by Sarro. He ſoon acquired ſuch celebrity, that in 1729 he was invited to Vienna by the emperor Charles VI.; who appointed him imperial poet, and granted him a penſion of 4000 florins. From that time ſome of his works were preſented at every court-feſtival; and notwithſtanding the extreme magni-

Metaſtaſio.

magnificence of theſe entertainments, they would now be forgotten were it not for the verſes which he compoſed upon the occaſion. The courts of Vienna and Madrid vied with each other in the preſents which they conferred upon him. From Maria Thereſa he received a ſnuff-box and a port-folio ſet with diamonds, and a golden candleſtick with a ſcreen. Ferdinand VI. king of Spain, informed of the great merit of Metaſtaſio by Farinelli, of whom he was a paſſionate admirer, ſent him a preſent of a caſket mounted with gold, and furniſhed with the different implements of writing. This favourite of kings and of the muſes was of a cheerful temper, and was exceedingly temperate: to this he was probably indebted for the uninterrupted health which he enjoyed, and for the entire poſſeſſion of his ſenſes and faculties to the moſt advanced period of old-age. He took his meals, aroſe, and went to bed, always at ſtated hours. This exactneſs and order were ſcrupulouſly obſerved even in the moſt trifling actions of his life. He uſed to ſay in jeſt, that he dreaded hell for no other reaſon but becauſe it was a place *ubi nullus ordo, ſed ſempiternus horror inhabitat*. He had even his ſtated hours for making verſes; to which he ſcrupulouſly adhered, without waiting for the moment of poetical enthuſiaſm. He was equally regular in the duties of the Chriſtian as in the labours of the ſcholar. His behaviour was that of a true philoſopher: his ambition extended no farther than the attainment of literary fame; and he deſpiſed every civil mark of diſtinction. When Charles VI. offered him the titles of *Count* or of *Baron*, which add no real worth or dignity to the poſſeſſor, but frequently make him appear in a more ridiculous light, he inſtantly begged the favour that he would allow him ſtill to continue *Metaſtaſio*. The empreſs Maria Thereſa afterwards wiſhed to beſtow upon him the ſmall croſs of St Stephen; but he excuſed himſelf on account of his age, which would prevent him from aſſiſting at the feſtivals of the order. He was attacked by a fever on the 2d of April 1782; and he died on the 12th of the ſame month, at the age of 84. Before his death he received the ſacrament according to the form of the Romiſh church; and Pius VI. who was then at Vienna, ſent him his apoſtolical benediction *in articulo mortis*, He left about 150,000 florins. He compoſed a great number of tragic operas, and ſeveral ſmall dramatic pieces which have been ſent to muſic. We have different editions of them in 4to, 8vo, and 12mo; and M. Richelet has publiſhed a tranſlation of them into French, in 12 vols, ſmall 12mo.

The greateſt part of Metaſtaſio's writings will confer immortality on their author. His dialogue is natural, ſimple, and eaſy; his ſtyle is always pure and elegant, and ſometimes ſublime and pathetic. His ſubjects are noble, intereſting, and excellently adapted for repreſentation. He was perfectly acquainted with the reſources of his art, and has ſubjected the opera to rules. He ſtripped it of its machinery, and of the marvellous, which was fitted to excite the gaze of aſtoniſhment, but which gave no inſtruction to the underſtanding, and made no impreſſion on the heart. His deſcriptions are copied from nature; the ſituations of his characters never fail to raiſe an intereſt in the reader, and often excite the tear of pity. His fables are celebrated; his characters are noble and well ſupported; his plots are excellently conducted, and happily unravelled. "There are ſcenes (ſays Voltaire) worthy of Corneille when he does not declaim, and of Racine when he is not feeble." His operas, in point of the pathetic, may be compared with our fineſt tragedies; and may be read with great pleaſure, independent of the charms of the muſic. We muſt not, however, expect to find in Metaſtaſio that exact regularity, and that fertile ſimplicity, which conſtitutes the excellence of ſome of our tragic poets: But though he ſometimes tranſgreſſes the unities of time and place, he always preſerves the unity of intereſt. Notwithſtanding all theſe advantages, ſome critics will not allow him the merit of invention, which is the firſt qualification of a poet. They conſider him only as a ſucceſsful imitator of the French tragic writers, from whom a great part of his beauties are borrowed, and place him at the head of the fineſt wits of Italy, but deny that he poſſeſſed genius. He was a fond admirer of the ancients; and this admiration, increaſing with the ſolidity of his underſtanding, continued to the laſt period of his life. He recommended reading them, as he himſelf had done, in a chronological order. His memory was excellent, and continued unimpaired even in old age. Horace was his favourite author, and he could repeat almoſt the whole of him. Metaſtaſio, who, as we have obſerved, was the pupil of the celebrated Gravina, added a gentleneſs of character peculiar to himſelf to the accuracy of thinking and great erudition of his maſter. His abilities and fame were reſpected by the critics in general; and whereas the life of moſt men of letters is one continued warfare, his days happily glided away in tranquillity and peace. The circumſtance which occaſioned the change of his name is thus related in a late anecdote: "Gravina's barber, who, like moſt of his profeſſion, was a great talker, one day informed him, that in the *Place de la Valicella*, where he had his ſhop, a young boy came every evening, and ſung extempore verſes of his own compoſition, ſo harmonious and elegant that all the paſſengers ſtopped to liſten to them. Gravina, upon this information, added one to the number of the young poet's audience, and found the verſes ſo ſuperior to the idea which he had formed of them from the account of the barber, and ſo much above the capacity of a child of ten or eleven years of age, that he inſtantly determined to undertake the cultivation of ſo promiſing a plant. His firſt care was to put the young *Trapaſſi* (which was the boy's name) to ſchool; but apprehending that the ordinary methods of education might check the progreſs of ſo uncommon talents, he took him home to his own houſe, and changed his name into *Metaſtaſio*, which ſignifies the ſame thing in Greek. In ſhort, by a plan of education and by inſtructions ſuited to his genius, Gravina laid the foundation of that reputation which he predicted, and which Metaſtaſio now enjoys." *Vies des Hommes Illuſtres d'Italie, Tom.* I. *p.* 187.

METASTASIS, in medicine, a tranſpoſition or ſettlement of ſome humour or diſeaſe in ſome other part; and ſometimes it ſignifies ſuch an alteration of a diſeaſe as is ſucceeded by a ſolution.

METATARSUS (μετα *beyond*, and ταρσος *the tarſus*), in anatomy, that part of the human ſkeleton containing

 containing the middle of the foot. See ANATOMY, n° 70

METATHESIS, in grammar, a ſpecies of the metaplaſmus; being a figure whereby the letters or ſyllables of a word are tranſpoſed, or ſhifted out of their uſual ſituations, as *piſtris* for *priſtis*, *Lybia* for *Libya*, &c.

This word is, by phyſicians, uſed with reſpect to morbific cauſes, which, when they cannot be evacuated, are removed to places where they are leſs injurious.

METELIN, the modern name of the iſland of Leſbos. See LESBOS and MITYLENE.

In the Iriſh Philoſophical Tranſactions for 1789, we have a deſcription of this iſland by the earl of Charlemont, in which he ſpeaks with raptures of its beauties. "The mountains, whoſe rugged tops exhibit a pleaſing interſperſion of rocks and fine groves, have their green ſides, for many miles along the coaſt, covered with olives, whoſe leſs agreeable verdure is corrected, embelliſhed, and brightened by a lively mixture of bays and laurels aſpiring to the height of foreſt-trees, of myrtles and pomegranates, of arbutes rich at once in bloſſom and in berry, of mulberries growing wild and laden with fruit, &c. Winter is here unknown, the verdure is perpetual, and the frequency of evergreens gives to December the colour of June. The parching heat of ſummer is never felt; the thick ſhade of trees, and thouſands of cryſtal ſprings which every where ariſe and form themſelves into unnumbered rivulets, joined to the refreſhing ſea-breeze the conſtant corrective and companion of noon tide heat, qualify the burning air and render the year a never-ending May. The houſes are conſtructed in ſuch a manner as to have the beſt view of theſe natural beauties. Each is a ſquare tower neatly built of hewn ſtone, ſo high as to overtop the trees, and to command a view of the ſea and neighbouring iſlands. The lower ſtories are granaries and ſtorehouſes; and the habitable apartments are all at the top, to which you aſcend by a ſtone ſtair, built for the moſt part on the outſide, and ſurrounding the tower; ſo that from the apartment the trees are overlooked, and the whole country is ſeen, while the habitations themſelves, which are very numerous, pearing above the groves, add life and variety to the enchanting proſpect, and give an air of human population to theſe woodlands, which might otherwiſe be ſuppoſed the region of Dryads, of Naiads, and of Satyrs."

The moſt remarkable thing, however, in this iſland is a cuſtom by which the women have here openly uſurped thoſe rights of ſovereignty which in other countries are ſuppoſed to belong eſſentially to the men. "Contrary (ſays his lordſhip) to the uſage of all other countries, the eldeſt daughter here inherits; and the ſons, like daughters every where elſe, are portioned off with ſmall dowers, or, which is ſtill worſe, turned out pennyleſs to ſeek their fortune. If a man has two daughters, the eldeſt, at her marriage, is intitled to all her mother's poſſeſſions, which are by far the greater part of the family eſtate, as the mother, keeping up her prerogative, never parts with the power over any portion of what ſhe has brought into the family, until ſhe is forced into it by the marriage of her daughter; and the father alſo is compelled to ruin himſelf by adding whatever he may have ſcraped together by his induſtry. The ſecond daughter inherits nothing, and is condemned to perpetual celibacy. She is ſtyled a *calogria*, which ſignifies properly a religious woman or nun, and is in effect a menial ſervant to her ſiſter, being employed by her in any office ſhe may think fit to impoſe, frequently ſerving her as waiting-maid, as cook, and often in employments ſtill more degrading. She wears a habit peculiar to her ſituation, which ſhe can never change; a ſort of monaſtick dreſs, coarſe, and of a dark brown. One advantage, however, ſhe enjoys over her ſiſter, that whereas the elder, before marriage, is never allowed to go abroad, or to ſee any man, her neareſt relations only excepted, the calogria, except when employed in domeſtic toil, is in this reſpect at perfect liberty. But when the ſiſter is married, the ſituation of the poor calogria becomes deſperate indeed, and is rendered ſtill more humiliating by the compariſon between her condition and that of her happy miſtreſs. The married ſiſter enjoys every ſort of liberty; the whole family fortune is hers, and ſhe ſpends it as ſhe pleaſes; her huſband is her obſequious ſervant; her father and mother are dependent upon her, ſhe dreſſes in a moſt magnificent manner, covered all over, according to the faſhion of the iſland, with pearls and with pieces of gold, which are commonly ſequins; thus continually carrying about her the enviable marks of affluence and ſuperiority, while the wretched calogria follows her as a ſervant, arrayed in ſimple homeſpun brown, and without the moſt diſtant hope of ever changing her condition. Such a diſparity may ſeem intolerable, but what will not cuſtom reconcile? Neither are the misfortunes of the family yet at an end. The father and mother, with what little is left them, contrive by their induſtry to accumulate a ſecond little fortune; and this, if they ſhould have a third daughter, they are obliged to give to her upon her marriage; and the fourth, if there ſhould be one, becomes her calogria; and ſo on through all the daughters alternately. Whenever the daughter is marriageable, ſhe can by cuſtom compel the father to procure her a huſband; and the mother, ſuch is the power of habit, is fooliſh enough to join her in teaſing him into an immediate compliance, though its conſequences muſt be equally fatal and ruinous to both of them. From hence it happens, that nothing is more common than to ſee the old father and mother reduced to the utmoſt indigence, and even begging about the ſtreets, while their unnatural daughters are in affluence; and we ourſelves have frequently been ſhown the eldeſt daughter parading it through the town in the greateſt ſplendor, while her mother and ſiſter followed her as ſervants, and made a melancholy part of her attendant train.

"The ſons, as ſoon as they are of an age to gain a livelihood, are turned out of the family, ſometimes with a ſmall preſent or portion, but more frequently without any thing to ſupport them; and thus reduced, they either endeavour to live by their labour, or, which is more uſual, go on board ſome trading veſſel as ſailors or as ſervants, remaining abroad till they have got together ſome competency, and then return home to marry and to be henpecked Some few there are who, taking advantage of the Turkiſh law, break through this whimſical cuſtom, who marry their calogrias, and

Metelin. retain to themſelves a competent proviſion: but theſe are accounted men of a ſingular and even criminal diſpoſition, and are hated and deſpiſed as conformiſts to Turkiſh manners, and deſerters of their native cuſtoms; ſo that we may ſuppoſe they are few indeed who have the boldneſs to depart from the manners of their country, to adopt the cuſtoms of their deteſted maſters, and to brave the contempt, the deriſion, and the hatred, of their neighbours and fellow-citizens.

"Of all theſe extraordinary particulars I was informed by the French conſul, a man of ſenſe and of indiſputable veracity, who had reſided in this iſland for ſeveral years, and who ſolemnly aſſured me that every circumſtance was true: but indeed our own obſervation left us without the leaſt room for doubt, and the ſingular appearance and deportment of the ladies fully evinced the truth of our friend's relation. In walking through the town, it is eaſy to perceive, from the whimſical manners of the female paſſengers, that the women, according to the vulgar phraſe, *wear the breeches*. They frequently ſtopped us in the ſtreets, examined our dreſs, interrogated us with a bold and manly air, laughed at our foreign garb and appearance; and ſhowed ſo little attention to that decent modeſty which is or ought to be the true characteriſtic of the ſex, that there is every reaſon to ſuppoſe they would, in ſpite of their haughtineſs, be the kindeſt ladies upon earth, if they were not ſtrictly watched by the Turks, who are here very numerous, and would be ready to puniſh any tranſgreſſion of their ungallant laws with arbitrary fines. But nature and native manners will often baffle the efforts even of tyranny. In all their cuſtoms theſe manly ladies ſeem to have changed ſexes with the men. The woman rides aſtride, the man ſits ſideways upon the horſe; nay, I have been aſſured that the huſband's diſtinguiſhing appellation is his wife's family name. The women have town and country houſes, in the management of which the huſband never dares interfere. Their gardens, their ſervants, are all their own; and the huſband, from every circumſtance of his behaviour, appears to be no other than his wife's firſt domeſtic, perpetually bound to her ſervice, and ſlave to her caprice. Hence it is that a tradition obtains in the country, that this iſland was formerly inhabited by Amazons; a tradition, however, founded upon no ancient hiſtory that I know of. Sappho indeed, the moſt renowned female that this iſland has ever produced, is ſaid to have had manly inclinations; in which, as Lucian informs us, ſhe did but conform with the ſingular manners of her countrywomen: but I do not find that the mode in which ſhe choſe to ſhow theſe inclinations is imitated by the preſent female inhabitants, who ſeem perfectly content with the dear prerogative of abſolute ſway, without endeavouring in any other particular to change the courſe of nature; yet will this circumſtance ſerve to ſhow, that the women of Leſbos had always ſomething peculiar, and even peculiarly maſculine, in their manners and propenſities. But be this as it may, it is certain that no country whatſoever can afford a more perfect idea of an Amazonian commonwealth, or better ſerve to render probable thoſe ancient relations which our manners would induce us to eſteem incredible, than this iſland of Metelin. Theſe lordly ladies are for the moſt part very handſome in ſpite of their dreſs, which is ſingular and diſadvantageous. Down to the girdle, which as in the old Grecian garb is raiſed far above what we uſually call the waiſt, they wear nothing but a ſhift of thin and tranſparent gauze, red, green, or brown, through which every thing is viſible, their breaſts only excepted, which they cover with a ſort of handkerchief; and this, as we were informed, the Turks have obliged them to wear, while they look upon it as an encumbrance, and as no inconſiderable portion of Turkiſh tyranny. Long ſleeves of the ſame thin material perfectly ſhow their arms even to the ſhoulder. Their principal ornaments are chains of pearl, to which they hang ſmall pieces of gold coin. Their eyes are large and fine; and the noſe, which we term Grecian, uſually prevails among them, as it does indeed among the women of all theſe iſlands. Their complexions are naturally fine; but they ſpoil them by paint, of which they make abundant uſe; and they disfigure their pretty faces by ſhaving the hinder part of the eyebrow, and replacing it with a ſtraight line of hair neatly applied with ſome ſort of gum, the brow being thus continued in a ſtraight and narrow line till it joins the hair on each ſide of their face. They are well made, of the middle ſize, and for the moſt part plump; but they are diſtinguiſhed by nothing ſo much and ſo univerſally as by a haughty, diſdainful, and ſupercilious air, with which they ſeem to look down upon all mankind as creatures of an inferior nature, born for their ſervice, and doomed to be their ſlaves; neither does this peculiarity of countenance in any degree diminiſh their natural beauty, but rather adds to it that ſort of bewitching attraction which the French call *piquant*."

His lordſhip has been at great pains to inveſtigate the origin of ſuch a ſingular cuſtom; but is unable to find any other example in hiſtory than that of the Lycians, who called themſelves by the names of their mothers, and not of their fathers. When aſked by their neighbours who they were? they deſcribed themſelves by their maternal genealogy. If a gentlewoman ſhould marry a ſlave, the children by that marriage were accounted noble; but ſhould the firſt man among them marry a foreign woman, the children would be accounted ignoble. This cuſtom is mentioned by ſeveral ancient authors. A difficulty of no little magnitude occurs, however, in accounting for the derivation of the inhabitants of Leſbos from the Lycians. This is ſolved in the following manner: In times of the moſt remote antiquity, the iſland of Leſbos was peopled by the Pelaſgi, who, under their leader Xanthus, the ſon of Triopas king of Argos, firſt inhabitated Leſbos: previous to that time they had dwelt in a certain part of Lycia which they had conquered; and in this country we may ſuppoſe they had learned the cuſtom in queſtion. But though this might readily be granted, as we know ſo little of the origin of ancient nations, yet the queſtion ſtill recurs, Whence did it originate among the Lycians? Here we are ſtill more difficulted than before; and the only thing we have to help us out is an obſcure tradition concerning Bellerophon, *viz.* that the hero having deſtroyed a boar which waſted the territory of Xanthus a city of Lycia, the inhabitants were ſo ungrateful as to return him no thanks for ſo great a favour; upon which, by his prayers, he cauſed the curſe of barrenneſs to fall upon them, but was at length

length prevailed upon, by the intreaties of the women, to intercede with his patron Neptune to pardon them. On this account it was decreed, that the people of Xanthus should be called by the names of their mothers and not of their fathers. Plutarch relates also, that Bellerophon not only freed the Lycians from an invasion of pirates, but from the Amazons also, whom he drove out of their country; "so that there may be some reason (says his Lordship) to suppose, that the Lycian women, by an intercourse with the Amazons, who had, it should seem, dwelt among them, were already previously prepared for the introduction of those customs, which were finally established in consequence of their patriotic merit in deprecating the wrath of Bellerophon, and in averting its fatal consequences."

This is the substance of what his Lordship advances to the origin of this extraordinary custom. He owns, that the traces are very obscure; and though he is conscious that such a speculation may be liable to ridicule, and he is aware "of some objections not easy to be answered, the coincidence will notwithstanding be allowed to be curious and very remarkable. The well known pertinacious adherence to ancient manners among the eastern nations, may in some measure excuse our credulity; and we may still add to our authority, by supposing that this same Xanthus may probably have given his name to the Lycian city of that denomination; and consequently must have inhabited that very part of Lycia where, according to Plutarch, he is supposed more immediately to have flourished."

METELLUS, the surname of the family of the Cæcilii at Rome, the most known of whom were ——A general who defeated the Achæans, took Thebes, and invaded Macedonia, &c.—Q. Cæcilius, who rendered himself illustrious by his successes against Jugurtha the Numidian king, from which he was surnamed *Numidicus*.—Another who saved from the flames the palladium, when Vesta's temple was on fire. He was then high priest. He lost his sight and one of his arms in the action; and the senate, to reward his zeal and piety, permitted him always to be drawn to the senate-house in a chariot, an honour which no one had ever before enjoyed. He also gained a great victory over the Carthaginians, &c.—Q. Cæcilius Celer, another who distinguished himself by his spirited exertions against Catiline. He married the sister of Clodius, who disgraced him by her incontinence and lasciviousness. He died 57 years before Christ. He was greatly lamented by Cicero, who shed tears at the loss of one of his most faithful and valuable friends.—L. Cæcilius, a tribune in the civil wars of J. Cæsar and Pompey. He favoured the cause of Pompey, and opposed Cæsar when he entered Rome with a victorious army. He refused to open the gates of Saturn's temple, in which were deposited great treasures; upon which they were broke open by Cæsar, and Metellus retired when threatened with death.—Q. Cæcilius, a warlike general who conquered Crete and Macedonia, and was surnamed *Macedonicus*. He had four sons, of which three were consuls, and the other obtained a triumph, all during their father's lifetime.—A general of the Roman armies against the Sicilians and Carthaginians. Before he marched, he offered sacrifices to all the gods except Vesta; for which neglect the goddess was so incensed, that she demanded the blood of his daughter Metella. When Metella was going to be immolated, the goddess placed a heifer in her place, and carried her to a temple at Lanuvium, of which she became the priestess.—Another, surnamed *Dalmaticus* from his conquest over Dalmatia, A. U. C. 634.—Cimber, one of the conspirators against J. Cæsar. It was he who gave the signal to attack and murder the dictator in the senate-house. —Pius, a general in Spain, against Sertorius, on whose head he set a price of 100 talents and 20,000 acres of land.

METEMPSYCHOSIS, (formed of μετα "beyond," and ἐμψυχω "I animate or enliven"), in the ancient philosophy, the passage or transmigration of the soul of a man, after death, into the body of some other animal.

Pythagoras and his followers held, that after death mens souls passed into other bodies, of this or that kind, according to the manner of life they had led. If they had been vicious, they were imprisoned in the bodies of miserable beasts, there to do penance for several ages; at the expiration whereof, they returned afresh to animate men. But, if they lived virtuously, some happier brute, or even a human creature, was to be their lot.

What led Pythagoras into this opinion was, the persuasion he had that the soul was not of a perishable nature: whence he concluded that it must remove into some other body upon its abandoning this. Lucan treats this doctrine as a kind of officious lie, contrived to mitigate the apprehension of death, by persuading men that they only changed their lodging, and only ceased to live to begin a new life.

Reuchlin denies this doctrine; and maintains that the metempsychosis of Pythagoras implied nothing more than a similitude of manners, desires, and studies, formerly existing in some person deceased, and now revived in another alive. Thus when it was said that Euphorbus was revived in Pythagoras, no more was meant than that the martial virtue which had shone in Euphorbus at the time of the Trojan war, was now, in some measure, revived in Pythagoras, by reason of the great respect he bore the *athletæ*. For those people wondering how a philosopher should be so much taken with men of the sword, he palliated the matter, by saying, that the soul of Euphorbus, *i. e.* his genius, disposition, and inclinations, were revived in him. And this gave occasion to the report, that Euphorbus's soul, who perished in the Trojan war, had transmigrated into Pythagoras.

Ficinus asserts, that what Plato speaks of the migration of a human soul into a brute, is intended allegorically, and is to be understood only of the manners, affections, and habits, degenerated into a beastly nature by vice. Serranus, though he allows some force to this interpretation, yet inclines rather to understand the metempsychosis of a resurrection.

Pythagoras is said to have borrowed the notion of a metempsychosis from the Egyptians; others say, from the ancient Brachmans. It is still retained among the Banians and other idolaters of India and China; and makes the principal foundation of their religion. So extremely are they bigotted to it, that they not only

Metemptosis. forbear eating any thing that has life, but many of them even refuse to defend themselves from wild beasts. They burn no wood, lest some little animalcule should be in it; and are so very charitable, that they will redeem from the hands of strangers any animals that they find ready to be killed. See PYTHAGOREANS.

METEMPTOSIS (from μετα "post," and πιπτω *cado* "I fall,") a term in chronology, expressing the solar equation, necessary to prevent the new moon from happening a day too late. By which it stands contradistinguished from *proemptosis*, which signifies the lunar equation, necessary to prevent the new moon from happening a day too soon.

The new moons running a little backwards, that is, coming a day too soon at the end of 312 years and a half; by the proemptosis, a day is added every 300 years, and another every 2400 years: on the other hand, by the metemptosis, a bissextile is suppressed each 134 years; that is, three times in 400 years. These alterations are never made but at the end of each century; that period being very remarkable, and rendering the practice of the calendar easy.

There are three rules for making this addition or suppression of the bissextile-day, and, by consequence, for changing the index of the epacts. 1. When there is a metemptosis without a proemptosis, the next following, or lower index, must be taken. 2. When there is a proemptosis without a metemptosis, the next preceding or superior index is to be taken. 3. When there are both a metemptosis and a proemptosis, or when there is neither the one nor the other, the same index is preserved. Thus, in 1600, we had D: in 1700, by reason of the metemptosis, C was taken: in 1800, there will be both a proemptosis and a metemptosis; so the same index will be retained. In 1900, there will be a metemptosis again, when B will be taken; which will be preserved in 2000, because there will then be neither the one nor the other. This is as far as we need compute for it: but Clavius has calculated a cycle of 301800 years; at the end of which period, the same indices return in the same order. See EPACT.

Meteorology. METEOR, (by the Greeks called μετεωρα, q. d. *sublima* or "high raised;" by the Latins *impressiones*, as making signs or impressions in the air), commonly denotes any bodies in the air that are of a flux or transitory nature. Hence it is extended to the phenomena of hail, rain, snow, thunder, &c.; but is most commonly confined to those unusual and fiery appearances named *falling-stars*, *ignes fatui*, *auroræ boreales*, &c. whether they appear at a great distance from the earth or not. See METEOROLOGY.

METEOROLOGICAL, something belonging to meteors.

METEOROLOGICAL Journal, is a table recording the daily state of the air, exhibited by the barometer, thermometer, hygrometer, anemometer, and other meteorological instruments. We have many journals of this kind, kept at the house of the Royal Society, and by different observers in other places, in the Philosophical Transactions, the Memoirs of the Academy of Sciences, and similar publications.

METEOROLOGY;

THAT science which investigates the phenomena of our atmosphere * (commonly called *meteors*), giving an account of the circumstances attending each, and explaining the causes from whence they arise.

* See *Atmosphere.*

1 Meteors, how divided. In considering this science, we find the objects of it naturally divided into two classes, *viz.* those which rise high in the heavens, seemingly without any connection with this earth; and others which are more particularly connected with the earth, or are perceptible only in the lower regions of the atmosphere. The former, which may properly be called *celestial meteors*, are only three in number, *viz.* the large fire-balls, falling stars, and aurora borealis. The second class is much more numerous; including the phenomena of the ordinary winds, rain, hail, snow, clouds and vapours of all kinds, thunder and lightning, hurricanes, whirlwinds, water-spouts, ignes fatui, and other wandering luminous appearances; not excepting the various changes of the atmosphere itself, with regard to its specific gravity, rarefaction, heat, and moisture, as indicated by the barometer, thermometer, and hygrometer.

2 Difficulties attending the subject. To treat of all these in a satisfactory manner, it is plain that we ought to have an intimate acquaintance with the constitution of the atmosphere; with the nature of those powerful agents by which it appears to be principally influenced, *viz.* fire, light, and electric fluid; and with their peculiar modes of operation and action upon one another and upon the atmosphere, and this in every possible variety of circumstances. Nor is even all this sufficient: The various phenomena of rain, wind, snow, thunder, heat, cold, &c. are known to depend very much upon the situation of different places on the surface of the earth; and their occasional variations are with great reason *suspected* to proceed, partly at least, from changes which take place in the bowels of the earth *: whence a meteorologist ought not only to be perfectly well acquainted with geography, but with mineralogy also; and that to an extent at which human knowledge will probably never arrive.

* See *Earth*.

In a science so very difficult, it is not to be supposed that any thing like a certain and established theory can be laid down: our utmost knowledge in this respect goes no farther as yet than to the establishment of a few facts; and in reasoning even from these, we are involved every moment in questions which seem scarcely within the compass of human wisdom to resolve.

3 Causes probably concerned. In considering the subject of meteorology, it will readily be admitted, that the whole atmospherical phenomena depend some how or other upon the action of the sun upon the earth, and the annual and diurnal revolutions of the latter. As these causes, however, are always invariably the same, why do we not find the same regularity in meteors that we do in other phenomena of nature? The eclipses of the sun and moon, for instance, which depend on the different po-

ſitions of the earth and moon with regard to the great luminary, are found to follow a certain and regular courſe; ſo that the very ſame eclipſes, both as to quantity and duration, which happened before will happen again. But with meteors the caſe is quite different. Moſt of the atmoſpherical phenomena are ſo various and uncertain, that no perſon can pretend to reduce them to any kind of rule. Every ſucceeding year, for inſtance, differs in a vaſt number of particulars from that which preceded it, even in ſuch as are the moſt ſimilar to one another. Sometimes we find a number of years ſucceſſively ſimilar to one another, and another ſet quite different taking place immediately after them; and ſome have even fancied that this ſucceſſion took place every 19 years, nearly the time of the revolution of the moon's nodes, though the obſervations on which this opinion is built are far from being ſufficient to eſtabliſh it: at any rate, the diſſimilarity between the phenomena of different years may ſufficiently warrant us to conclude, that other cauſes beſides the regular action of the ſun and revolution of the earth are concerned. Some of theſe cauſes may be ſuppoſed to be fermentations and other commotions within the bowels of the earth itſelf; but as all fermentation is a regular proceſs, and takes place only in certain circumſtances, of which heat is a very conſiderable one, why is there not annually a certain quantity of this fermentation excited, and why are not regular effects obſerved in proportion? It does not indeed appear, that the immenſe variety which occurs in meteorological appearances can by any means be accounted for but by the interference of ſome cauſes in their own nature *irregular*; that is, capable of ſuch endleſs variety, that no aſſignable ſpace of time is ſufficient to exhauſt it. Theſe cauſes, as they cannot be proved to exiſt either on the ſurface of the earth or in its internal parts, muſt be ſought for in the celeſtial expanſe itſelf. Sir Iſaac Newton ſuppoſed the planets to be influenced by the comets, and that from the tails of the latter ſome of the finer parts of our atmoſphere were produced. He even ſuppoſed, that from theſe bodies a quantity of water, imagined to be waſted in the various operations of nature, might be ſupplied. But if it is not unreaſonable to ſuppoſe that *comets* anſwer ſome ſuch purpoſes in nature, it is as little unreaſonable to think that the *planets* may influence the atmoſpheres of one another. That this muſt be the caſe indeed is very probable, not only on account of the light they reflect upon one another, but alſo by reaſon of their ſpheres of mutual attraction, which extend an immenſe way, and are ſo powerful in the planets Jupiter and Saturn, that they diſturb the motions of each others ſatellites as they paſs. But beſides even theſe cauſes, if we allow them to be ſuch, there are others which take place in the immenſe void betwixt the celeſtial bodies, and which has with great impropriety been determined an abſolute vacuum. That changes do take place in this ſpace, is evident from what is related of the temporary diſappearance of ſome of the ſatellites of Saturn, and their ſudden re-appearance, without any perceptible change in our atmoſphere ſo as to affect our view of other celeſtial objects. It may appear ridiculous to think, that a change in ſuch diſtant regions ſhould have any influence upon the atmoſphere of the earth; but we muſt remember, that if the univerſe is connected together as one vaſt ſyſtem, which we have every reaſon to believe, it is as impoſſible that a change can take place in any part without affecting the whole in ſome degree, as it is impoſſible to change any part of a clock or watch without in ſome meaſure affecting the whole movement.

5
Or in the ſun.

But of all the changes which take place in the celeſtial regions, thoſe which affect the ſun ſeem moſt likely to produce changes in our atmoſphere, and to be the hidden cauſe of many meteorological phenomena. That the ſun is not exempt from thoſe changes, is evident from the ſpots which are always or for the moſt part to be ſeen on his diſk when viewed through a teleſcope. It has been obſerved in ſome years, that the ſun has ſeemed to loſe his influence, and even to the naked eye appeared much dimmer than uſual. In ſuch caſes it is impoſſible but our atmoſphere, and even the whole ſolar ſyſtem, muſt have been affected; and not only muſt the ſeaſons for the preſent time have felt the malign influence of thoſe ſpots, but the atmoſphere itſelf may have acquired ſuch a diſpoſition as to produce ſeaſons of a peculiar nature for a number of years afterwards. If it be true, according to the hypotheſis of ſome, that the ſun is ſupplied with fuel by comets falling into his body, it is plain that every new acceſſion of this kind muſt have a proportionable effect upon all the bodies expoſed to his light. If the comets do not perform any ſuch office, ſtill it is very probable that they anſwer ſome purpoſes to the planets, becauſe they are never ſeen without the planetary regions: and though their influence be not immediately perceptible, it is impoſſible to prove that they have none, nor indeed is it probable that they have not; for we are very certain, that the influence of any object extends as far as its light, and how much farther we cannot tell. Conſidering the matter in this view, therefore, there is not a ſpot which can obſcure the ſun, a comet that can appear in the celeſtial regions, a planet that can approach the earth, nor perhaps a belt or ſpot which can take place on Mars, Jupiter, or Saturn, which may not be productive of important changes in our atmoſphere, and affect the meteors produced by it in many different ways.

6
Action of the ſun, moon, and planets, concerned.

It would no doubt be an error to have recourſe to ſo many obſcure cauſes, were there any plain and obvious ones from whence the phenomena could be deduced. But the endleſs variety of meteors which occur throughout every part of the globe, plainly ſhow that the cauſes, whatever they are, muſt be infinitely varied alſo. The principal one is no doubt the action of the ſun upon the earth and atmoſphere in its various poſitions: but this is regular; and, did nothing elſe interfere, would produce regular effects. Secondary cauſes probably are the action of the moon and planets: but theſe alſo are regular, though much more diverſified than the former: ſo that we are at laſt obliged to have recourſe to cauſes ſtill more obſcure and remote, as comets, ſpots on the ſun, and changes taking place in the etherial fluid which pervades the whole celeſtial expanſe. Theſe we muſt either aſſign as the remote cauſes of the phenomena of our atmoſphere,

ſphere, or admit others equally obſcure; or we muſt be contented to own our ignorance, as indeed muſt at all events be frequently the caſe.

But though, to ſatisfy ourſelves, ſuch conjectures may occaſionally be indulged, it is not from them that we are to derive any of the regular phenomena of nature; for theſe are evidently owing to the ſettled and eſtabliſhed action of heat, light, and electric matter, which have already been enumerated as the great powers influencing, and indeed in a great meaſure forming, the ſubſtance of our atmoſphere. The moſt remarkable effects of theſe are,

7 Evaporation a principal cauſe of meteors.

I. *Evaporation.* This, which is the principal cauſe of almoſt all the meteors of our atmoſphere, may be reckoned in a more particular manner the effect of heat. Upon this principle it is explained under the article CHEMISTRY, where vapour is ſhown to be a compound of water and fire; and ſuch it is ſuppoſed to be by M. de Luc, in his Treatiſe on Meteorology, as well as by other philoſophers of the higheſt rank.

8 Natural evaporation different from artificial.

In conſidering this operation, however, as carried on by nature, we will ſoon find, that it proceeds in a manner very different from what takes place in our chemical operations. In the latter, evaporation is merely the effect of heat; and the proceſs cannot go on without a conſiderable degree of it, eſpecially if the veſſel containing the fluid be cloſe. In the natural way, on the contrary, the proceſs goes on under almoſt every degree of cold we know; the vapours aſcend to an height which has never yet been determined; and, from the extreme cold which they ſuſtain, ſhow evidently that they are connected with our atmoſphere by means of ſome other agent beſides heat.

9 Dryneſs of the upper regions of the atmoſphere.

From the continual aſcent of vapour indeed, if the operations of nature were of the ſame kind with thoſe of art, the upper parts of our atmoſphere would be always involved in a fog, by reaſon of the condenſation of the vaſt quantity which continually aſcends thither; but ſo far is this from being the caſe, that in thoſe elevated regions to which the vapours continually aſcend, the air is much drier than at the ſurface of the ground.

10 Surpriſing inſtances of this dryneſs.

This was experienced by M. de Sauſſure and M. de Luc in their journeys up the Alps. The air was there found to be exceſſively dry, and evaporation to go on much more rapidly than below; ſo that the ſurface of their bodies was parched up, and an exceſſive thirſt took place by reaſon of the great abſorption of the moiſture. The ſame dryneſs was manifeſt by the hygrometer, which could ſcarce ever be brought to indicate any moiſture, even when our travellers were ſurrounded with clouds, hail, and rain. From many experiments, indeed, it is evident, that water, after being reduced into a ſtate of vapour, is capable of undergoing a certain change, by which it lays aſide its fluidity entirely, and even to appearance its ſpecific gravity; ſo that it becomes, as far as we can judge, a ſubſtance totally different from what it was before.

11 Water ſometimes changes its nature.

This may be underſtood from the common operation of ſlacking lime; for in that caſe, the water unites with the lime ſo intimately, that the whole aſſumes the form of a dry powder, extremely greedy of moiſture, and which cannot be reduced to its former ſtate of quicklime without undergoing a much greater degree of heat than the water by itſelf could bear. The ſame thing is manifeſt from mixing dry plaſter of Paris with water; for thus a vaſt quantity of the water is fixed, and becomes in a manner ſolid. A ſtill more remarkable inſtance is in ſending the ſteam of water over red-hot iron; for there the fluid unites in ſuch a manner with the metal, that it cannot be expelled from it even by the heat of a burning-glaſs. Other inſtances are mentioned under the article WATER: here we are to conſider the changes which the element undergoes after being reduced to the ſtate of vapour.

12 Partic... account ... natura... evapo... tion.

The firſt of theſe is, its aſſuming the appearance of ſmoke or fog when mixed with the common atmoſphere; which ſmoke, when examined by a microſcope, appears to be compoſed of an infinite number of ſpherules of water, hollow, and filled with a fluid ſpecifically lighter than air, by which means they aſcend in it. As long as the aqueous vapour retains this viſible form, it retains alſo its humidity, and will again become a liquid, and wet whatever comes in its way; and this the more readily, while it retains any ſenſible degree of heat. As the vapour cools in the atmoſphere, it gradually aſſumes an aerial ſtate, mixing itſelf with the air ſo as to be no longer diſtinguiſhable from it. In this ſtate the air itſelf does not by any means appear to become more moiſt, but continually drier the more water it receives. This, however paradoxical it may ſeem, is a certain fact: for in ſummer, though we are aſſured that evaporation goes on very rapidly from the ſurface both of the ſea and land, yet the air, ſo far from being moiſt, is much drier than at any other time; and yet we know that the whole quantity evaporated is ſome how or other received by the atmoſphere. After the water has attained to this ſtate, our inquiries concerning it muſt in a great meaſure ſtop. We know not now, whether it has the form of ſmall hollow ſpherules, or whether it really becomes part of the atmoſphere itſelf, and aſſumes the form of what we call *dephlogiſticated air*.

13 Is cap... of be... compo...

From ſome experiments in which that kind of air is produced from water, we are certain, that part of this element is converted into air: but in theſe operations, the evaporation of the water is prevented by being carried on in cloſe veſſels; ſo that we cannot tell whether that which would be mere ſteam in the open air, becomes dephlogiſticated air in cloſe veſſels or not. From the immenſe waſte of dephlogiſticated air, indeed, and the vaſt quantity which always ſurrounds the earth, we may ſuſpect that the water, after undergoing the natural proceſs of evaporation, does really become changed into this aerial fluid; and thus we will have a more ample ſource of it than can be derived from vegetation, or any other cauſe with which we are yet acquainted.

14 Obſer... tions of M. de L.

On this ſubject M. de Luc has ſome very curious obſervations, built principally upon the new doctrine of the compoſition of water; which, though a poſition maintained by the antiphlogiſtians, is by no means inconſiſtent with the exiſtence of phlogiſton, but rather a proof of it. Our author firſt began to alter his ſentiments concerning the *aqueous* exiſtence of vapour in the atmoſphere, from the circumſtance already mentioned concerning the great *dryneſs* of the upper atmoſpherical regions already taken notice of.

A very remarkable inſtance of this was, that the ferule of his cane dropped off during his journey up one of the Alpine mountains, which he never had obſerved it to do before. It is obſerved likewiſe, that the air in theſe elevated regions is ſomewhat drier in the night than in the day-time; for which M. de Luc gives the following reaſon, viz. that the air on the plains being condenſed by the cold, the ſuperior air muſt ſubſide, and the air on the mountains of courſe be replaced by the drier air from above them; though he thinks that this dryneſs may alſo be imputed in part to ſome other cauſe. This increaſe of dryneſs in the night, however, ſeems leſs conſtant than that in the day-time. Our author has often arrived at the tops of mountains before ſun-riſe, and ſometimes found the graſs covered with dew; though he never had the good fortune to be able to determine the ſtate of the air for want of an hygrometer: nor indeed could the appearance of dew be any certain indication of the ſtate of the atmoſphere, there being ſtrong reaſons to believe, that dew is occaſioned in great meaſure by vegetables themſelves; for graſs, when covered with glaſs plates, was found to become moiſt as well as that which had been expoſed to the open air. In this caſe, the plates became moiſt both on the upper and under ſides; but when ſuſpended a foot above the ground, they were found to be covered with dew only on the upper part.

5 [...]uſ[...]re[...] [...]f ac[...] [...]dry[...] [...]f the

The dryneſs of the air on the tops of high mountains was otherwiſe accounted for by M. Sauſſure.— When on Mount Blanc, at the height of 7200 feet above the level of the ſea, he found, that from ſix in the evening till half paſt five next morning, his hygrometer moved 21 degrees (the whole ſcale containing 100) towards dryneſs. But this he accounts for by ſaying, that from ſunriſe to three or four in the afternoon, the quantity of vapours in the neighbourhood of the earth is continually diminiſhing, becauſe they *aſcend* in the atmoſphere, either in virtue of their own levity, or by means of a vertical wind, which he ſuppoſes to be produced by the heat of the ſun; that, from the time juſt mentioned till next morning, their quantity increaſes in the lower ſtrata, becauſe the upper vapours re-deſcend in proportion as they condenſe; and that in the higher regions of the atmoſphere, the reverſe ought to be the caſe, as the upper ſtrata are then left drier by the previous deſcent of the vapours. This argument, however, is contra-

6 [...]ient

dicted by M. Sauſſure himſelf in another part of his work; where he ſays, that in the middle of the day, when the ſun is hotteſt, the air in the neighbourhood of the earth contains really more *water* than it does at the moment when a refreſhing dew falls. It is beſides impoſſible that a *vertical* wind can ever be occaſioned by the heat of the ſun; for this produces only a general expanſion of the whole body of the atmoſphere, as a condenſation of it is occaſioned by the action of cold: neither could any conſiderable quantity of vapour (ſuppoſing with M. Sauſſure that it is a chemical ſolution of water in air) deſcend in the night-time; for, according to him, this compound differs very little from common air in its capacity of being expanded and condenſed. Neither, according to M. Sauſſure himſelf, can any part of the water with which the air is combined deſcend at all, until ſome portion of the former becomes ſuperſaturated with it, that is, till it has received more than it can hold in ſolution. But if this ſhould happen to be the caſe, the ſuperfluous quantity would then appear in the form of a miſt or cloud, and the hygrometer would indicate extreme humidity; whereas the contrary indication conſtitutes the difficulty.

17 Aerial vapour cannot be condenſed by cold.

It is beſides evident, from innumerable inſtances, that mere cold will not by any means occaſion the condenſation of aerial vapour. A moſt remarkable example of this is given by M. de Luc, in an account of a ſtorm in which he was involved on one of the Alps. "Though the hygrometer (ſays he) was within $33\frac{1}{2}$ degrees of extreme dryneſs, or $66\frac{1}{2}$ from extreme humidity, thick clouds formed around us, which obliged us to think of retreating: in a little time the ſummit of the mountain was ſurrounded by them: they ſpread and covered the whole horizon: a premature night ſurpriſed us in a very dangerous road; and we ſuffered one of the moſt violent tempeſts I ever experienced, of wind, rain, hail, and thunder. The ſtorm laſted great part of the night, and extended all over the neighbouring mountains and plains; and after it had ceaſed, the rain continued, with only a few intermiſſions, till next day at noon. In one of theſe intervals, I examined the hygrometer on the outſide of our cabin; it ſhowed only $1\frac{6}{8}$ more humidity than before; and even this increaſe was no more than what the difference of heat was capable of producing. Nevertheleſs, new clouds continually rolled around us; and the rain, which preſently began again, accompanied us as it were by fits to the bottom of the mountain. When arrived there, we ſaw the clouds diſperſe entirely. I obſerved the hygrometer again in the open air; and though the earth was all drenched with water, and the heat of the ſun much leſs, the hygrometer was $1^{\circ}\frac{7}{16}$ drier than it had been two days before, after a courſe of fine weather. Where was all this water, and all the ingredients of the ſtorm, while the hygrometer ſhowed ſuch a degree of dryneſs in the very ſtratum where it was formed?"

18 M. de Luc's definition of vapour.

M. de Luc adopts the opinion concerning vapour which has been publiſhed in this work, under the articles CHEMISTRY, EVAPORATION, and many others, viz. that it is a combination of fire with water. By *vapour*, however, he does not mean the viſible ſteam iſſuing from heated liquids, but that inviſible and ſubtile fluid which is found to be formed even *in vacuo*, and which of conſequence diſproves the hypotheſis of thoſe who hold that vapour is a ſolution of water in air. Our author, however, gives a ſolution of the difference betwixt what he calls *fog* or *miſt* and vapour, which ſeems not founded upon any evident principle. According to him, this vapour cannot ſubſiſt unleſs the particles of water united to the fire be at a certain diſtance from one another. When this diſtance is leſſened, a decompoſition takes place by reaſon of the attraction of the aqueous particles to one another; and they then appear in their proper form of a liquid, the fire diſſipating itſelf through the atmoſphere. The ſmalleſt diſtance to which the particles can be brought without any decompoſition, varies

varies according to the temperature; but is always conſtant in the ſame degree. When the thermometer ſtands at temperate, or thereabouts, watery vapours, compreſſed into the ſmalleſt ſpace they can bear, are found to have between $\frac{1}{16}$th and $\frac{1}{36}$th of the elaſticity of air; but have leſs than $\frac{1}{150}$th of its weight. If ſuch vapour, however, be mixed with air, the minimum diſtance is greatly increaſed, by reaſon of the interpoſition of aerial particles; and thus it can ſubſiſt under a much greater preſſure than it could otherwiſe endure. In the heat of boiling water they can, without any mixture of air, bear the preſſure of the atmoſphere: for ebullition, under any given preſſure, cannot take place until the vapour produced in the liquor has acquired a degree of expanſive force ſufficient to raiſe the liquor into bubbles under that preſſure; and as long as the vapour retains this heat, it muſt continue capable of reſiſting the ſame preſſure. As the heat abates, a decompoſition begins; hence the opaque ſteam over boiling water, which, by becoming vapour again by uniting with the fire it meets with in a larger ſpace, is diffuſed by its expanſibility.
19 Evaporation of the clouds. Thus, vapours are continually undergoing decompoſitions and new vaporifications. This evaporation of the clouds after they were once formed, M. de Luc obſerved very evidently; ſome parts being continually detached, and gradually diminiſhing and diſappearing, while new ones are formed; ſo that the clouds do not continue the ſame for two moments together; and the evaporation goes on ſo faſt, that a cloud could not ſubſiſt without conſtant and large ſupplies.—Theſe phenomena appear to be independent of heat and cold: for ſometimes clouds form ſuddenly in the middle of a hot day; and after they have poured down their water, all is clear again: and ſometimes they evaporate after ſunſet, gradually vaniſhing in the calmeſt weather without any change of place.—The appearances are ſuch as would be produced by a large maſs of water in violent ebullition, ſuſpended inviſibly in the atmoſphere; and the ſimilarity of effect naturally points out an analogy in the cauſe; that is, a ſource of vapour in the atmoſphere itſelf. It is only when the vapour is produced too abundantly and too rapidly to be diſperſed by evaporation that rain is formed; the veſicles in this caſe running together, and the water falling to the lower part, as it does in ſoap-bubbles, till they become thin enough to burſt.

20 Remarks on M. De Luc's obſervations. With regard to this explanation, however, though it may account for the artificial production and decompoſition of vapour, it does not ſeem to anſwer for that produced in the natural way. That the latter is certainly in a ſtate of dryneſs, cannot be denied; but it cannot be proved that ever any artificial ſteam is ſo, let the heat be what it will. Though the approach of the aqueous particles to one another, therefore, by a diminution of temperature, may occaſion the decompoſition of artificial ſteam, it does not ſeem to be ſo in the natural way; nor is there any ſource from which we can reaſonably infer a very great and ſudden acceſſion of vapour from the earth to the upper regions of the atmoſphere in particular places, which might increaſe the proximity of the aqueous particles, and thus bring on rain according to M. de Luc's hypotheſis. It muſt likewiſe be remembered, that, according to the doctrine upon which M. de Luc founds his ſyſtem, water, when decompoſed, is not converted into one ſpecies of air, but into two, viz. the dephlogiſticated and inflammable, each of which contains a quantity of undecompoſed water; ſo that there is ſtill ſome ambiguity in the experiments; and as the two ſhrink up into very little bulk by their union, there ſhould ſeem to be danger of producing vacuums of immenſe extent by the ſudden union of the two airs in the high atmoſpherical regions.—Theſe vacuums, were they to extend over the whole ſpace occupied by a large cloud, might occaſion dreadful concuſſions by the ruſhing in of the air to ſupply them: or even if we ſuppoſe them to be diſperſed interſtitially, they muſt certainly affect the barometer very greatly; which does not appear to be the caſe. M. Sauſſure, who paſſed ſeveral nights on one of the Alps, at the height of 10,578 feet above the level of the ſea, does not mention any conſiderable variation of the barometer, though he was frequently involved, during that time, in the moſt violent ſtorms of hail, wind, ſnow, thunder, and lightning. In the warm climates alſo, where we ſhould think that the vaſt deluges of rain would often ſink the barometer to an amazing degree, yet we ſeldom hear of any remarkable variation. M. de Prielong, in his account of Meteorological Obſervations made at Goree in 1787, informs us, that there were 16 or 18 hurricanes; and that the greater part of theſe raiſed the barometer from one twelfth to a ſixth part of an inch; others ſunk it as much, and ſome did not at all affect it. Another cauſe muſt therefore be concerned, which diminiſhes the rarefaction, or condenſes the air as faſt, or nearly ſo, as the condenſation of the vapour would rarefy it: and that another cauſe really is concerned, we learn from M. Reynier, who has made a great number of obſervations upon the vapours formed on the Alps, and gives us the following account. 21 M. Reynier's obſervations. "In the morning, the vapours condenſed by the coldneſs of the night riſe along the mountains in proportion as the ſun riſes above the horizon.—When the weather will be fine, they glide uniformly on the brink of the mountain, and riſe over it by a regular motion, ſomewhat ſlow. When rain impends, the motion is irregular: they are alternately attracted and repelled by the mountain, and riſe like elaſtic bodies rebounding. In a ſtormy ſeaſon, particularly when there will be hail, the motions are ſtill more rapid and irregular." "This obſervation (add the Monthly Reviewers, from whom the above quotation was taken) may be confirmed in the mountainous countries of Great Britain; we have ſeen it among the mountains of Cumberland, particularly in the neighbourhood of Keſwick. M. Reynier obſerves, and the obſervation is ſufficiently near the ſurface not to be overlooked, that the appearance is electrical."

22 Conſideration on the nature of the fluid into which water is reduced by vaporation. Before we proceed to give any ſolution of the *decompoſition* of vapour, it will be neceſſary to conſider a little farther the nature of that fluid or fluids into which water is converted when it aſſumes a dry ſtate in the atmoſphere. In the experiments of Lavoiſier and others, it ſeems with great probability to be reduced into the two different kinds of air already mentioned; but M. de Luc does not think that the atmoſphere

mosphere naturally contains any such fluids. Air, when artificially decomposed, does not contain inflammable, but phlogisticated or mephitic, air, mixed in a certain proportion with the dephlogisticated kind. These have different specific gravities; and our author is of opinion, that two fluids of this kind could not mingle uniformly with one another without separating through time: and as the dephlogisticated air has the greatest specific gravity, it thence follows, that the under parts of the atmosphere ought to be almost entirely composed of that kind, and the upper strata of the mephitic or inflammable kind. But this does not appear to be the case; so that M. de Luc concludes, that air is an homogeneous fluid, every particle being similar to every other, and consisting of all the ingredients that we extract from the mass, together, probably, with others yet unknown to us. Though a mixture of vital and mephitic air produces many of the effects of atmospheric air, we cannot thence conclude their absolute identity: the one may suffer a decomposition in order to the production of these effects, while the other produces them immediately. The mixture may support life for a time, but will it equally maintain health also? Though mephitic air by the mixture of one-third of vital air is prevented from being immediately fatal, we are not authorised to conclude that it is altogether innocent. On the whole then, if it is not in the immediate product of evaporation that rain has its source; if the vapours change their nature in the atmosphere, so as to be no longer sensible to the hygrometer or to the eye; if they do not become vapour again till clouds appear; and if, when the clouds are formed, no alteration is observed in the quality of the air; we must acknowledge it to be very probable, that the intermediate state of vapour is no other than air; and that the clouds do not proceed from any distinct fluid in the atmosphere, but from a decomposition of a part of the air itself, perfectly similar to the rest."

This opinion of M. de Luc appears the more probable, that the two ingredients into which water is artificially resolved, by the late experiments do not by any means re-compose atmospherical air by simple mixture; for these explode with extreme violence on the application of flame: the common atmosphere, also, when decomposed, does not resolve itself into dephlogisticated and inflammable air, but into the former, and what is called phlogisticated or the mephitic kind, the difference of which in specific gravity is much less than between dephlogisticated and inflammable airs, though it is probable that even these are connected either by means of a chemical union, or by some other ingredient we do not yet know. By this union the qualities of both may be in some measure changed, and a third kind of substance formed, as neutral salts may be made out of acids and alkalies This third substance, which we call the common atmosphere, is proper for preserving both animal and vegetable life, which neither of the two ingredients are capable of doing; for plants wither and die in dephlogisticated air, and animals are suffocated in a moment by the mephitic kind; nor, indeed, do we know whether the dephlogisticated kind be altogether proper for the sustenance of animal life for any considerable length of time. It certainly will sustain it much longer than an equal quantity of atmospherical air, even the purest we are acquainted with; but it is equally certain that animals confined in it die much sooner than according to its apparent purity they ought to do. It is not an unreasonable hypothesis, therefore, that though water may be artificially separated into the two fluids called dephlogisticated and inflammable airs, yet in the natural way the decomposition does not proceed beyond a certain point, which we may, in a subject of such an obscure nature, call a *chemical union*, or a state in which the two ingredients exist, and are capable of being separated when the air comes into contact with certain substances. Hence, when the atmosphere is taken into the lungs of an animal, some of the dephlogisticated part may enter the blood, and the phlogisticated part combining more intimately with the rest, may form fixed air or part of it appear in its proper form. In like manner, when the common atmosphere comes in contact with a vegetable, it is possible that the phlogisticated part may be absorbed by it, and the dephlogisticated part set free, which in the atmosphere may form new combinations, &c.

25
Air and water convertible into each other.

Granting this to be the case, and we can scarcely hope for a more probable conjecture on the subject, the decomposition of the vapour will be easily accounted for. If by any natural process the water can be converted into air, and if the latter is only water partially decomposed; then, by an inversion of the process, air may be instantly re-converted into water, and will become visible in fog or mist, or be condensed into rain, consisting of greater or smaller drops, according to the degree to which this inverted process is carried. With regard to the means used by nature for carrying on these two opposite processes, we can say very little; because the agents concerned in them are entirely beyond the reach of our senses. From M. Raynier's observation, indeed, of the clouds being attracted by the hills, it would seem probable that electricity was ultimately concerned, but in what manner we cannot determine. On this hypothesis, however, we may explain the phenomenon taken notice of by M. de Luc and others, viz. that even during the time of excessive rains the hygrometer showed scarce any signs of moisture, and that the clouds were in a constant state of evaporation or dissolution in the air. The hygrometer, we know, cannot show signs of moisture, unless it absorbs it, and it cannot absorb, unless the air around it really contains more vapour in an aqueous form than the hygrometer itself does. But in very elevated regions this can scarce ever be the case. So much of the pressure of the atmosphere is then taken off, that the water contained in any substance resolves itself into vapour with the utmost facility. Hence bodies brought from the lower regions into the higher will undoubtedly part with a great deal of the moisture they contained in the lower parts of the atmosphere, and which was kept in it by the superior pressure of the atmosphere in these parts. For the same reason, though the air in the upper regions should be made ever so moist, a body such as the hygrometer can never absorb so much as it would otherwise do, because the water in these regions has a natural tendency to fly away from it. It appears, however, that there was in reality *some* variation of the hygrometer, though small; and had it been possible to conſtruct an hygrometer of materials found on the top of the mountain, which might be ſaid to be naturalized to the climate, the ſcale of variation might probably have been larger, though there is no reaſon to think that it ever would be ſo large as on the plain. For the ſame reaſon, as ſoon as the proceſs has been inverted, by which water was converted into air, the evaporation inſtantly takes place in the vapour that has been produced. We are to conſider, that the atmoſphere is never diſpoſed to let fall *the whole* of the vapour it contains, for this would amount almoſt to an annihilation of it. Both proceſſes go on at once; and it is only in particular parts that the reverſe proceſs takes place. Thus clouds are formed: but as theſe ſeldom continue ſtationary, they no ſooner come into a ſituation where the contrary operation is going on, than they begin to evaporate; and even in the very ſame place, as ſoon as the condenſing proceſs has ſtopped, the other begins; as we ſee that even in the moſt damp and moiſt weather there is a conſtant evaporation going on; ſo that during the very time that rain is falling, the atmoſphere is taking up what lies upon the ground.—Hence alſo we may ſee why the hygrometer indicated a greater degree of dryneſs in the night than in the day time, viz. becauſe the evaporation from the earth is leſs during the night than in the day time.

24 Electricity of the atmoſphere conſidered.

II. Having now in ſome meaſure explained the phenomena of natural evaporation, we muſt next conſider thoſe of the *Electricity* of the atmoſphere. Under the article ELECTRICITY, the nature of that fluid is ſo fully diſcuſſed, and its identity with the ſolar light rendered ſo probable, that there ſeems no farther occaſion for entering into ſpeculations upon the ſubject. We ſhall therefore, without taking any notice of the arguments of M. de Luc for its being a compound fluid, proceed to conſider, according to the principles laid down in that article, how far electricity is concerned in producing the phenomena of meteorolgy.

25 Different agents concerned in producing all meteors.

In this inquiry we muſt obſerve, that as none of the agents by which thoſe phenomena are produced can act by themſelves, but muſt always be aſſiſted by the reſt, ſo we are not to aſcribe any one phenomenon to the influence of a ſingle agent without the reſt.—Thus, though in evaporation heat is principally concerned, and though evaporation is the principal cauſe of the appearance of clouds, &c. yet we do not find that heat is the *ſole* cauſe of evaporation; neither is evaporation the ſole cauſe of the appearance of clouds. In like manner, though electricity is the principal cauſe of many of the more grand phenomena of nature, yet electricity does not act by itſelf, but in conjunction with aqueous vapours; and when the atmoſphere ceaſes to contain any of theſe vapours, it is highly probable that it ceaſes to manifeſt any of the common effects of electricity alſo.

26 Electricity of the earth explained.

The general electricity of the earth has, under the article ELECTRICITY, been ſhown to depend upon the abſorption of the rays of the ſun by the land and water, eſpecially by the latter. As this abſorption muſt undoubtedly be ſtrongeſt in thoſe places where the greateſt quantity of rays fall upon the ſurface, it follows, that the emiſſion muſt be greateſt where the feweſt are abſorbed; that is, at the poles. Hence, were there no obſtacles, the electrical fluid would iſſue forth in vaſt quantities at each pole, very little being emitted in the intermediate ſpaces. By reaſon of the reſiſtance made by the great body of the earth, and the immenſe fields of ſnow and ice with which the polar regions are conſtantly enveloped, and which are much leſs perfect conductors than liquid water, the electric fluid, once abſorbed, has no free paſſage through any particular part of the globe, and therefore forces out every where throughout the whole ſurface. This paſſage is facilitated by the moiſture contained in the atmoſphere; and thus the proceſſes of evaporation and electricity aſſiſt one another: for where the air has for a long time been very dry, we find that the electric fluid cannot readily paſs, and violent thunder and lightning, nay ſometimes earthquakes, are ready to enſue. Hence alſo the common obſervation relative to thunder, viz. that there is ſeldom much thunder when it begins to rain before the thunder comes on: The reaſon is, that the rain, being an excellent conductor, facilitates the paſſage of the electric matter through the air, and keeps up the equilibrium without any violence or exploſion.

As the electric matter gets out of the earth, it is naturally driven upwards to the higher parts of the atmoſphere, where it probably aſſiſts in the decompoſition of air, or reſolving air into water, as has been already ſaid. When clouds are formed, it preſſes ſtrongly upon them by reaſon of their conducting nature: and hence all clouds, whether high or low, are found to be electrified; as are likewiſe all fogs, of whatever kind. The fluid getting ſtill higher and higher, at laſt aſcends beyond the regions of our atmoſphere, into the unknown ſpaces which are the reſidence of thoſe firſt of all created agents which conduct the planets round the ſun, and act as the *primum mobile* of nature.

Thus there is a circulation in the electric fluid as there is in the water. It deſcends originally from the ſun; pervades the whole ſubſtance of the globe; and perſpiring, as it were, at every pore, aſcends beyond the clouds; and, paſſing the extreme boundaries of our atmoſphere, returns to the ſun from whence it came. As the ſphere of its action in returning, however, muſt always increaſe, it follows, that after it has got beyond the bounds of the atmoſphere, the ſigns of its action muſt continually become leſs and leſs, nay, moſt probably vaniſh entirely; becauſe it is there oppoſed by an immenſe quantity of ſimilar matter, acting in an oppoſite or different direction from itſelf.

This laſt conſideration leads into a very curious ſpeculation, and in a very plauſible manner anſwers an objection, the force of which it would otherwiſe be very difficult to avoid. "If the electric fluid be no other than the light of the ſun abſorbed by the earth, and emitted from it again by innumerable ſmall vents, how comes it to paſs that it is not perpetually drained off from the upper regions as faſt as it arrives, without ſhowing any ſign of being reſiſted. The phenomena of thunder, of rain, nay of every meteor, manifeſtly ſhow that it often meets with very great reſiſtance; but this could not happen, unleſs there was without the atmoſphere ſomething capable of reſiſting and counteracting the vehement impulſe of all the electric fluid with which the earth is filled. This reſiſtance is very evident: for if there were none, there could

27 How the electric matter is confined in the atmoſphere.

could not be any accumulation of electricity in the upper regions of the atmoſphere, but a rarefaction in it would take place ſimilar to what there is of air in the ſame regions. But this is ſo far from being the caſe, that all the electrical phenomena are much ſtronger in the upper than in the lower regions."

To ſolve this objection, Mr Morgan, in a late paper in the Philoſophical Tranſactions, ſuppoſes that an abſolute vacuum, ſuch as he imagines the celeſtial ſpaces to be, is abſolutely *impenetrable* by the electric fluid. But this ſeems not far from a contradiction. Sir Iſaac Newton imagined the celeſtial ſpaces to be void of all matter, on account of the apparent facility with which the planets move through them; and we ſee that the rays of light, the impulſe of which is accounted ſcarce any thing at all, do penetrate them. To ſuppoſe, indeed, that a mere non-entity can act either by reſiſtance or any way elſe, is an abſurdity. How can any perſon imagine, that a perfect vacuum, which even a feather by its weight can cauſe it pervade from one end to the other, ſhould be impenetrable by a flaſh of lightning? It is true, indeed, that from ſome experiments it is found, that when the air is exhauſted very perfectly from a receiver, we cannot force an electric ſpark through it. But this, ſo far from proving that there is *nothing* in the glaſs, plainly ſhows that there is *ſomething* in it which makes a greater reſiſtance than we can overcome: and it is very probable that this ſomething is no more than the electric fluid itſelf; for as we are very certain that the electric fluid can *impell*, ſo we are equally certain that it can *reſiſt*. The truth is, that it is not in our power to move this fluid at all but by leſſening in one part the reſiſtance it meets with; in which caſe it moves very freely of itſelf: juſt as we can move the air with great facility, provided we allow the reſt to follow; but if we attempt to puſh a quantity of air before us, without allowing any to follow it to ſupply the vacuity, we will meet with a moſt violent reſiſtance. In the caſe of electric fluid, we can make it circulate from one part of the earth to another by means of conductors: but we cannot force any part of it to a diſtance from the reſt, nor can we cauſe a ſmall quantity expel a large one from any place, otherwiſe than by breaking the equilibrium; in which caſe the quantity which follows is preciſely equal to that which went before. In the caſe of a perfect Torricellian vacuum, we cannot diſcharge a bottle through it, without ſetting in motion all that quantity which is contained in the glaſs, as well as all that is connected with it, which it ſeems is more than the power of any machine can do. In like manner, the atmoſphere of the earth being ſurrounded by an immenſe and inconceivable quantity of electric matter, it cannot eſcape without putting in motion a quantity of that matter equal to what goes out. But this quantity, upon the whole, can never be greater than that which the earth every moment abſorbs from the ſun. Were a greater quantity to iſſue forth, it would be reſiſted by all the reſt, even to the utmoſt boundaries of the univerſe; a power which no created being could overcome. As matters ſtand at preſent, the reſiſtance is inconceivably great: for from the laws of mechanics it is evident, that action cannot exiſt without re-action; ſo that where there is no reſiſtance, there can be no effort. In all caſes we ſee that where the electric matter has a good conductor, it moves ſilently, and without ſhowing any marks of power whatever. If it meets with a ſmall reſiſtance it makes a ſmall effort, and a greater one if a greater reſiſtance is made, and ſo in proportion. The violence with which this fluid acts in ſome caſes, ſhows the ſtrength of the reſiſtance to it all around; for, like other fluids, we are certain that this one alſo acts with equal force all around it, and the exploſion is always made at the leaſt reſiſting part. The electric fluid of the atmoſphere, therefore, is confined by a very great power, which it is not by any means able to overcome, but which yields in a certain degree to its impulſe every moment, in proportion to the freſh ſupplies yielded by it to the earth, and which ſupplies come every moment from the ſun.

29 Of heat and cold as agents.

III. Heat and cold are very powerful agents in producing various meteors: but theſe are only relatives, and different modifications of the ſame fluid; the former being its action from a centre, the latter its action from a circumference to a centre. Though we do not know what connection there is between heat, cold, and what we call electricity, yet we know that this laſt is very much affected by them; for heat makes bodies more pervious to electricity than otherwiſe they would be, and cold makes them leſs ſo.—Hence the moſt violent electrical phenomena are obſerved in hot countries; while in the colder regions thoſe which depend on a more moderate electrification, as auroræ boreales, are more frequent. The prevalence of heat and cold in particular places, however, depends upon circumſtances which are altogether unknown to us; and therefore we cannot inveſtigate the modes of their operation in ſuch a particular manner as could be wiſhed. From what has been already ſaid, however, about the nature of the different agents concerned in meteorology, both in this article and in other parts of the work, we may take the following view of the cauſes of meteors in general.

30 Particular explanations of meteors.

1. Evaporation, combined with electricity, produces all the phenomena of vapour, fog, clouds, rain, &c.; and according as theſe two are joined to certain degrees of heat or cold, they produce dew, hoar-froſt, rain, hail, or ſnow.

The phenomena of dew and hoar-froſt ſeem to proceed from a quantity of aqueous and undecompoſed vapour which always exiſts in the atmoſphere; and which, being raiſed by mere heat, is condenſed by mere cold, without undergoing that proceſs by which water is changed into air. Hence it both aſcends and deſcends; for if we cover a ſmall ſpace of ground with plates of glaſs, they will be wetted both above and below. The reaſon of this is, that the evaporation from the ground does not ſtop immediately after the air begins to cool, eſpecially if it be covered with any thing which prevents the acceſs of the cold air, as the glaſs plates do in this caſe. The cold air, therefore, acting upon the glaſs, condenſes the vapour below it, in the ſame manner that the h[illegible] or the receiver of a retort condenſes the vap[illegible] riſe from the matter to be diſtilled. If the cold be very intenſe, hoar-froſt appears inſtead of dew; [illegible] nothing more than the dew frozen after it [illegible] the ground, in the ſame manner that the vapou[illegible] warm

warm room congeals on the inside of the windows in a frosty night. As this seems to be the whole process, it has not been observed that any electricity is concerned in the production of dew.

When the vapour has been thoroughly decomposed, and become invisible, it very frequently returns back to its pristine state, so far as to assume the appearance of mist or fog. In this case, electricity appears evidently to be concerned; for Mr Cavallo has observed that all fogs are electrified. When the process has advanced farther, and the water begins to collect into drops, the electricity is still more remarkable; and it is with great reason supposed that it is by means of electrical repulsion that the drops of rain keep at a regular distance from one another. When the cold is intense, and the electricity strong, the drops of water are frozen, and hail is produced: but snow indicates a more moderate degree of electricity; and a very violent cold, accompanied with a strongly electrical atmosphere, produces that excessively disagreeable vapour in the polar regions called *frost-smoke*, which is a general congelation of all the aqueous moisture contained in the atmosphere.

2. By violent electricity alone are produced the phenomena of thunder, lightning, fire-balls, ignes fatui, and the aurora borealis. In the phenomena of thunder, evaporation and the other agents by which rain and hail are produced are also concerned; though electricity is most remarkably so, and thunder and lightning of the most violent kind frequently occur without any rain. The ignis fatuus, aurora borealis, large fire-balls, and the smaller ones called falling-stars, seem to depend upon electricity alone, without any aid from evaporation, or from heat or cold. Aurora borealis, indeed, is most common in the northern and southern parts of the world, where the cold is intense; though this seems to be owing, not to the cold, but to the natural emission of the electrical fluid from the polar regions in much greater quantities than from others. The fire-balls commonly appear collected on the very extreme boundaries of the atmosphere, where, from the violent resistance already mentioned, the fluid is confined as it were in a concave shell, which it cannot by any means penetrate in great quantities in any particular place. Though these fire balls, therefore, contain an immense quantity of this fluid, they can only proceed in an horizontal direction, and never fly perpendicularly up from the earth, as those will sometimes do which are formed nearer the ground. The ignis fatuus seems to depend on the strong electricity of a certain portion of atmosphere, the cause of which is not well understood.

3. By the action of heat and electricity combined, are produced the phenomena of hurricanes, whirlwinds, and water-spouts. It is not, indeed, known in what manner those agents combine themselves to produce such tremendous effects; but it seems evident that electricity is concerned in them, as the sea-water becomes unusually clear before an hurricane, and many signs of electricity are likewise observed in the heavens.

4. The winds are supposed to proceed mostly from the heat of the sun rarifying the atmosphere, and occasioning a continual influx of fresh air to fill up the vacuum; but very violent winds are frequently observed where no such cause can be supposed to exist.—Thus, on the tops of high mountains the winds are commonly very violent; and mountainous countries, especially when cold, are for the most part also subject to high winds. As the tops of mountains, however, are known to be strongly electrified by their attracting and repelling the clouds, we must suppose that this electricity has a considerable share in producing the winds which are generally so violent on their tops.—This will appear the more probable, when we consider that frequently storms of wind, and those of the most violent kind, seem to be brought along with clouds; as, for instance, that mentioned under the article MALTA, in which a dreadful tempest, brought along with a cloud, almost destroyed the whole town.

Uses of meteors.

Thus we have endeavoured to give a general sketch of the doctrine of METEOROLOGY: a more particular detail of the causes by which meteors are produced is given under the names of each of them as they occur in the order of the alphabet. With regard to their uses, those of the more magnificent and tremendous kind seem to be destined to preserve the balance of the electric fluid in the atmosphere, the want of which would be productive of the most fatal effects to the world in general. The effects of the inferior ones are more confined, and are of use only to particular districts, scarcely ever extending their influence over a whole country. Thus the clouds, which produce rain for the purposes of vegetation, do not extend themselves over a whole country at once, but transitorily fly over different parts of it; so that when it is rain, for instance, in one place, it may be sunshine in another, thunder in a third, &c. It is, however, surprising to observe how equally these act over the whole of a very large tract of land; so that though there is never precisely the same weather in two places twenty miles distant from one another, yet vegetation goes on without any perceptible difference in the one as well as the other; neither, unless there be some very remarkable difference in the weather of one year from that of another, will there be any perceptible difference in the crop. For a more particular investigation of this point, however, see the articles VEGETATION and WEATHER.

For the application of meteorology to the foreknowledge of the weather, see the article WEATHER.

METEOROMANCY, a species of divination by meteors, principally by lightning and thunder. This method of divination passed from the Tuscans to the Romans, with whom, as Seneca informs us, it was held in high esteem.

METESSIB, an officer of the eastern nations, who has the care and oversight of all the public weights and measures, and sees that things are made justly according to them.

METHEGLIN, a species of mead; one of the most

Metheglin, Methodists.

most pleasant and general drinks the northern parts of Europe afford, and much used among the ancient inhabitants: (See Mead). The word is Welsh, *meddyglin*, where it signifies the same.—There are divers ways of making it; one of the best whereof follows: Put as much new honey, naturally running from the comb, into spring-water, as that when the honey is thoroughly dissolved an egg will not sink to the bottom, but be just suspended in it; boil this liquor for an hour or more, till such time as the egg swim above the liquor about the breadth of a groat; when very cool, next morning it may be barrelled up; adding to each 15 gallons an ounce of ginger, as much of mace and cloves, and half as much cinnamon, all grossly pounded; a spoonful of yeast may be also added at the bung-hole to promote the fermentation. When it has done working, it may be closely stopped up; and after it has stood a month, it should be drawn off into bottles.

METHOD, the arrangement of our ideas in such a regular order, that their mutual connection and dependence may be readily comprehended. See Logic, Part IV.

METHODISTS, in ecclesiastical history, is a denomination applied to different sects, both Papists and Protestants.

I. The *Popish Methodists* were those polemical doctors, of whom the most eminent arose in France towards the middle of the 17th century, in opposition to the Huguenots or Protestants. Those Methodists, from their different manner of treating the controversy with their opponents, may be divided into two classes. The one may comprehend those doctors, whose method of disputing with the Protestants was disingenuous and unreasonable, and who followed the examples of those military chiefs, who shut up their troops in intrenchments and strong holds, in order to cover them from the attacks of the enemy. Of this number were the Jesuit Veron, who required the Protestants to prove the tenets of their church by plain passages of scripture, without being allowed the liberty of illustrating those passages, reasoning upon them, or drawing any conclusions from them; Nihusius, an apostate from the Protestant religion; the two Walenburgs, and others, who confined themselves to the business of answering objections and repelling attacks; and cardinal Richelieu, who confined the whole controversy to the single article of the divine institution and authority of the church. The Methodists of the second class were of opinion, that the most expedient manner of reducing the Protestants to silence, was not to attack them by piecemeal, but to overwhelm them at once, by the weight of some general principle or presumption, some universal argument, which comprehended or might be applied to all the points contested between the two churches: thus imitating the conduct of those military leaders who, instead of spending their time and strength in sieges and skirmishes, endeavoured to put an end to the war by a general and decisive action. These polemics rested the defence of Popery upon prescription; the wicked lives of Protestant princes who had left the church of Rome; the crime of religious schism; the variety of opinions among Protestants with regard to doctrine and discipline; and the uniformity of the tenets and worship of the church of Rome. To this class belong Nicolle the Jansenist doctor, the famous Bossuet, &c.

Methodists.

II. The *Protestant Methodists* form a very considerable body in this country. The sect was founded in the year 1729 by one Mr Morgan and Mr John Wesley. In the month of November that year, the latter being then fellow of Lincoln college, began to spend some evenings in reading the Greek New Testament, along with Charles Wesley student, Mr Morgan commoner of Christ-church, and Mr Kirkham of Merton-college. Next year two or three of the pupils of Mr John Wesley and one pupil of Mr Charles Wesley obtained leave to attend these meetings. Two years after they were joined by Mr Ingham of Queen's-college, Mr Broughton of Exeter, and Mr James Hervey; and in 1735 they were joined by the celebrated Mr Whitefield, then in his 18th year.

At this time it is said that the whole kingdom of England was tending fast to infidelity. "It is come (says Bishop Butler), I know not how, to be taken for granted by many persons, that Christianity is not so much as a subject of inquiry, but that it is now at length discovered to be fictitious; and accordingly they treat it as if in the present age this were an agreement among all people of discernment, and nothing remained but to set it up as a principal subject of mirth and ridicule, as it were by way of reprisals, for its having so long interrupted the pleasures of the world." The Methodists are said, with great probability, to have been very instrumental in stemming this torrent. They obtained their name from the exact regularity of their lives; which gave occasion to a young gentleman of Christ-church to say, "Here is a new set of *Methodists* sprung up;" alluding to a sect of ancient physicians which went by that name. This extreme regularity, however, soon brought a charge against them, perhaps not altogether without foundation, of being too scrupulous, and carrying their sanctity to too great an height. In particular it was urged, that they laid too much stress upon the rubrics and canons of the church, insisted too much on observing the rules of the university, and took the scriptures in too literal a sense; and to the name of *Methodists* two others were quickly added, *viz.* those of *Sacramentarians* and the *Godly club*.

The principal person in this club while in its infancy appears to have been Mr Morgan, and next to him Mr John Wesley. They visited the sick, and instituted a fund for the relief of the poor; and the better to accomplish their benevolent designs, Mr Wesley abridged himself of all his superfluities, and even of some of the necessaries of life; and by proposing the scheme to some gentlemen, they quickly increased their funds to 80 l. *per annum*. This, which one should have thought would have been attended with praise instead of censure, quickly drew upon them a kind of persecution; some of the seniors of the university began to interfere, and it was reported "that the college censors were going to blow up the Godly club *." They found themselves, however, patronised and encouraged by some men eminent for their learning and virtue; so that the society still continued, though they had suffered a severe loss in 1730 in the death of Mr Morgan, who had indeed been the founder of it. In the month of October 1735, John and Charles Wesley,

* See Hervey's Life, p. 105.

Methodists. ley, Mr Ingham, and Mr Delamotte son to a merchant in London, embarked for Georgia along with Mr Oglethorpe, afterwards General Oglethorpe. The design of this voyage was to preach the gospel to the Indians. By this time, however, it appears, that Mr Wesley had embraced such notions as may without the least breach of charity be accounted fanatical. Thus in a letter to his brother Samuel, he conjures him to banish from his school "the classics with their poison, and to introduce instead of them such Christian authors as would work together with him in 'building up his flock in the knowledge and love of God."

During the voyage such a profusion of worship was observed, as we cannot help thinking savoured more of a Pharisaical than Christian behaviour; an account of which, as a similar strictness would certainly be inculcated upon the disciples, and consequently must give a just idea of the principles of the early Methodists, we shall here transcribe from Mr Wesley's Life. "From four in the morning till five each of us used private prayer; from five to seven we read the Bible together, carefully comparing it (that we might not lean to our own understandings) with the writings of the earliest ages; at seven we breakfasted: at eight were the public prayers; from nine to twelve learned the languages and instructed the children; at twelve we met to give an account to one another what we had done since our last meeting, and what we designed to do before our next; at one we dined; the time from dinner to four we spent in reading to those of whom each of us had taken charge, or in speaking to them separately as need required; at four were the evening prayers, when either the second lesson was explained (as it always was in the morning), or the children were catechised and instructed before the congregation; from five to six we again used private prayer; from six to seven I read in our cabin to two or three of the passengers, of whom there were about 80 English on board, and each of my brethren to a few more in theirs; at seven I joined with the Germans in their public service, while Mr Ingham was reading between decks to as many as desired to hear; at eight we met again, to instruct and exhort one another; between nine and ten we went to bed, when neither the roaring of the sea nor the motion of the ship could take away the refreshing sleep which God gave us."

As they proceeded in their passage, this austerity instead of being diminished was increased. Mr Wesley discontinued the use of wine and flesh; confining himself to vegetables, chiefly rice and bisket. He eat no supper; and his bed having been made wet by the sea, he lay upon the floor, and slept soundly till morning. In his Journal he says, "I believe I shall not find it needful to go to bed, *as it is called*, any more;" but whether this was really done or not, we cannot say.

The missionaries, after their arrival, were at first very favourably received, but in a short time lost the affections of the people entirely. This was owing to the behaviour of Mr Wesley himself, who appeared not only capricious but frequently despotic. He particularly gave offence by insisting upon the baptism of children by immersion; and his excessive austerity with regard to himself did not tend to give his hearers any favourable opinion either of the superior sanctity or wisdom of their teacher. At last, on account of a difference with Mr Causton the store-keeper and chief magistrate of Savannah, which ended in a law-suit, he was obliged to return to England.

Thus the cause of Methodism seemed to be entirely lost in Georgia. But Mr Wesley was soon succeeded by a more popular and successful champion, *viz.* Mr George Whitefield; who having spent his time during the voyage in converting the soldiers with whom he sailed, arrived at Savannah in Georgia on the 7th of May 1738. Here he was received by Mr Delamotte, was joined by several of Mr Wesley's hearers, and became intimate with some other ministers. Mr Ingham had made some progress in converting a few runaway Creek Indians, who had a settlement about four miles from Savannah; but being obliged to return to England in a few months, this design was frustrated, and the Indians in a few years separated. During the short time that Mr Whitefield resided at Savannah, he became extremely popular: and indeed the instances of his success in the way of making converts are very surprising. However, he was obliged to return to England in the autumn of that year, that he might receive priests orders. On his return to America in October 1739, he landed at Philadelphia, and instantly began his spiritual labours as in other places; being attended with astonishing success not only there but wherever he went. Passing through the colonies of Virginia, Maryland, North and South Carolina, the number of converts continually increased; but on his arrival at Savannah, he found the colony almost deserted. He now resumed the scheme he had formerly projected of building an orphan-house; and for this he made the first collection at Charlestown in South Carolina, amounting to about 70 l. sterling. His zeal in the cause of religion, or of the colony, were not, however, sufficient to procure him the favour of those in power. On his return to Philadelphia, after a short stay at Savannah, the churches were denied him; but he was made ample amends by the success which attended his field preachings and private efforts. Religious societies were every where set up, and many were converted with symptoms of enthusiasm, different according to their various tempers and constitutions. During this excursion, he was so successful in his collection for the orphan-house, that on his return to Savannah he brought along with him money and provisions to the value of 500l. sterling.

The success in Georgia was now greater than ever; but the many charities which it was necessary to supply, rendered it necessary in a short time for him to undertake another journey to Charlestown. Here his principles met with the greatest opposition. He had lost the favour of the commissary by his field-preaching, and was denied the sacrament. The opposition, however, was altogether fruitless; the number of converts increased wherever he went, and he now undertook a voyage to New England. In this place also the established clergy were his enemies; but the usual success attended his other endeavours, and procured 500 l. more for the use of the orphans in Georgia.

From the year 1741 to 1742 America was deprived of Mr Whitefield's preachings, he having spent that interval in England; but in 1744 he again set out for the

Methodists. the western continent. The remarkable success which had hitherto attended his labours now stirred up many opponents; and these had met with the greater success, as none of the Methodist preachers whom he had left were possessed of such abilities either to gain the favour of those who heard them, or to defend their doctrines against objections. Mr Whitefield's success, however, was the same as before: he even found means to inspire the military class with such sentiments of devotion, that Colonel Pepperell could not undertake his expedition against Louisbourg without first consulting Mr Whitefield; and great numbers of New-Englanders went volunteers, confident of victory, in consequence of the discourses of their teacher.

From the continent of America Mr Whitefield took a voyage to the Bermudas islands; and here, as every where else, he met with the most surprising success. Here also collections were made for the Orphan-house in Savannah, which were transmitted to that place.

Supposing it to be better for his cause to visit different countries, than to take up a permanent residence in one, Mr Whitefield left Bermudas in a few months, and did not return to America till 1751, when the Orphan-house was found to be in a very flourishing situation. After a short stay, he set sail again for Britain. Here he remained two years, and then set out on another visit to America, landing at Charlestown on the 27th of May 1754. His presence constantly revived the spirits and cause of his party, and added to their numbers wherever he went. Next year he returned to England; but after labouring in the usual manner, and meeting with the usual success there till the year 1763, he set sail again for America, and arrived at Virginia in the latter end of August. He now visited all the colonies, and found that great progress had been made in converting the Indians. On his arrival at Georgia, matters were found in a very flourishing situation, and he received the thanks of the governor and principal people for the great benefit he had been to the colony; which shows, that the stories which had been so industriously propagated, concerning the avarice of him and other Methodist preachers, were, partly at least, unfounded. In 1765 he returned to England; and in 1769 made his seventh and last voyage to America, landing at Charlestown on the 30th of November the same year. He was still attended with the same success; and indeed it is impossible to read, without admiration, an account of the efforts made by himself and Mr Wesley, to propagate their tenets in the different parts of the world.

For a very considerable time Mr Whitefield was the only Methodist who paid any attention to America; and in that country he was more popular than even in Europe. Towards the end of his life several Methodists having emigrated from Britain, formed distinct societies in New York and Philadelphia. These quickly increased in number; and, about the time that the war with Britain began, their numbers amounted to about 3000 in Virginia, Maryland, New York, and Pennsylvania. They would probably have increased much more, had it not been for the imprudence of some of their preachers, who introduced politics into their discourses, and thus rendered themselves obnoxious to the people among whom they lived. Among those who hurt the cause in this manner was Mr Wesley himself, who, by writing a piece intitled *A Calm Address to the American Colonies*, would in all probability have ruined it, had not a gentleman, with whom he was connected, destroyed or sent back to England the whole impression as soon as it arrived in America, so that its existence was scarce known in that continent. At the conclusion of the war, Dr Coke, who in 1776 had left a curacy in England in order to join Mr Wesley, paid a visit to his friends in America; though it had been imagined that a total separation had taken place between the American and European Methodists. This breach was, however, made up by a manœuvre of Mr Wesley; for no sooner had the Americans obtained their independence, than he, who had hitherto branded them with the name of *rebels*, sent a congratulatory letter on their freedom from the "State and the Hierarchy," and exhorting them to "stand fast in that liberty with which God had so strangely made them free." To show his zeal in their service still farther, he gave ordination, by laying on of hands, to several preachers who were to embark for America, and consecrated Dr Coke one of the bishops of the Methodist Episcopal church in that country. He extracted also from the liturgy of the English church one for the American Methodists, taking particular care to expunge every expression that had a particular respect to the regal authority.

Such proceedings in one who had formerly professed such extraordinary attachment to the English church, could not but require an apology; and this was accordingly made in a pastoral letter transmitted to the American societies, and addressed "to Dr Coke, Mr Astbury, and our brethren in North America." In this letter he makes the following defence of his conduct. "Lord King's account of the primitive church convinced me, many years ago, that bishops and presbyters are the same order, and consequently have the same right to ordain. For many years I have been importuned, from time to time, to exercise this right, by ordaining part of our travelling preachers. But I have still refused, not only for the sake of peace, but because I was determined, as little as possible, to violate the established order of the national church to which I belonged. But the case is widely different between England and North America. Here there are bishops who have a legal jurisdiction; in America there are none, neither any parish-ministers: so that for some hundred miles together, there is none either to baptize, or to administer the Lord's supper. Here, therefore, my scruples are at an end; and I conceive myself at full liberty, as I violate no order, and invade no man's right, by appointing and sending labourers into the harvest. It has indeed been proposed to desire the English bishops to ordain part of our preachers for America; but to this I object. 1. I desired the bishop of London to ordain only one, but could not prevail. 2. If they consented, we know the slowness of their proceedings; but the matter admits of no delay. 3. If they would ordain them now, they would likewise expect to govern them; and how grievously would that entangle us. 4. As our American brethren are now totally disentangled, both from the state and the English

Methodiſts. gliſh hierarchy, we dare not entangle them again either with the one or the other. They are now at full liberty ſimply to follow the ſcripture and the primitive church; and we judge it beſt, that they ſhould ſtand faſt in that liberty wherewith God has ſo ſtrangely made them free."

Dr Coke, on the conſecration of Mr Aſtbury to the office of a biſhop, made another apology. "The church of England (ſays he), of which the ſociety of Methodiſts in general have till lately profeſſed themſelves a part, did for many years groan in America under grievances of the heavieſt kind. Subjected to a hierarchy which weighed every thing in the ſcale of politics, its moſt important intereſts were repeatedly ſacrificed to the ſuppoſed advantages of England. The churches were in general filled with the paraſites and bottle-companions of the rich and great. The humble and moſt importunate intreaties of the oppreſſed flocks, yea the repreſentations of a general aſſembly itſelf, were contemned and deſpiſed. Every thing ſacred muſt bow down at the feet of a party; the holineſs and happineſs of mankind be ſacrificed to their views; and the drunkard, the fornicator, and the extortioner, triumphed over bleeding Zion, becauſe they were faithful abettors of the ruling powers. The memorable revolution has ſtruck off theſe intolerable fetters, and broken the antichriſtian union which before ſubſiſted between church and ſtate. And had there been no other advantage ariſing from that glorious epoch, this itſelf, I believe, would have made ample compenſation for all the calamities of the war; one happy conſequence of which was the expulſion of moſt of thoſe hirelings, who "eat the fat, and clothed themſelves with the wool, but ſtrengthened not the diſeaſed," &c. The parochial churches in general being hereby vacant, our people were deprived of the ſacraments through the greateſt part of theſe ſtates, and continue ſo ſtill. What method can we take in ſo critical a juncture? God has given us ſufficient reſources in ourſelves; and, after mature deliberation, we believe that we are called to draw them forth.

"But what right have you to ordain?" The ſame right as moſt of the churches in Chriſtendom; our ordination, in its loweſt view, being equal to any of the preſbyterian, as originating with three preſbyters of the church of England. "But what right have you to exerciſe the Epiſcopal office?" To me the moſt manifeſt and clear. God has been pleaſed to raiſe up, by Mr Weſley, in America and Europe, a numerous ſociety well known by the name of *Methodiſts*. The whole body have invariably eſteemed this man as their chief paſtor under Chriſt. He has conſtantly appointed all their religious officers from the higheſt to the loweſt, by himſelf or his delegate. And we are fully perſuaded there is no church office which he judges expedient for the welfare of the people entruſted to his charge, but, as eſſential to his ſtation, he has power to ordain. "But, do not you break the ſucceſſion?" The uninterrupted ſucceſſion of biſhops is a point that has long been given up by the moſt able Proteſtant defenders of epiſcopacy. Biſhop Hoadley himſelf, in his celebrated controverſy with Dr Calamy, allows it to be unneceſſary. His words are, 'To the 13th queſtion I anſwer, that I think not an uninterrupted line of ſucceſſion of regularly ordained biſhops neceſſary.' He alſo grants the authenticity of the anecdote given us by St Jerom, which informs us, that the church of Alexandria had no regular ſucceſſion from the time of St Mark the evangeliſt, the firſt biſhop of that church, to the time of Dionyſius, a ſpace of 200 years; but the college of preſbyters, on the death of a biſhop, elected another in his ſtead. We are alſo informed, from the epiſtle of St Clement to the Corinthians, written ſoon after the death of St Paul, a writer whoſe works are next in precedence to the canon of ſcripture, and probably written by immediate inſpiration, that the church of Corinth was then governed only by a college of Preſbyters. And from the epiſtle of Polycarp to the church of Philippi, written in 116, we alſo find that the Chriſtian Philippians were then governed only by a college of Preſbyters. So that the primitive Chriſtians were ſo far from eſteeming the regular ſucceſſion as eſſential to the conſtitution of a Chriſtian church, that, in ſome inſtances, epiſcopacy itſelf was wholly omitted."

Such was the defence urged by Mr Weſley for this extraordinary aſſumption of epiſcopal powers: a conduct, however, of which he afterwards repented, as tending to make a final ſeparation betwixt his followers and the church of England. Yet it does not appear that this had any bad effect on the minds of his American brethren; for Dr Coke, on his arrival on the weſtern continent, found the ſocieties numerous and flouriſhing. His firſt efforts were directed againſt the ſlave-trade; and not only the abolition of that traffic, but the releaſe of all thoſe who were actually ſlaves at the time, ſeem to have been his favourite objects. By interfering in this matter, however, perhaps with too much zeal, he involved himſelf in danger. Some riots took place, and a lady offered the mob 50 guineas if they would give the Doctor 100 laſhes. This piece of diſcipline would have been inflicted, had it not been for the interpoſition of a ſturdy colonel; and the Doctor had not only the ſatisfaction of eſcaping the intended puniſhment, but of ſeeing his doctrine ſo far attended to, that ſome ſlaves were emancipated.

Mr Hanſon, in his Memoirs of Mr Weſley, obſerves, that "the coloniſts, in the infancy of Methodiſm, conducted themſelves with more propriety than the Engliſh. There was little or no perſecution, nor any thing like a riot, except in one or two inſtances which have been mentioned as the conſequence of the animadverſions on ſlavery; and even theſe were productive of no miſchief. Not a creature was materially injured; no bones were broken, nor any lives loſt; which was not the caſe in this country. Here many thouſands of innocent people were ſubjected to the groſſeſt indignities, and ſeveral were eventually ſacrificed to the fury of their perſecutors.

"While we commend the Americans for their behaviour in oppoſition to the brutality of Engliſh mobs, it may be proper to inquire into the ſources of this diſtinction. Something of this may have ariſen from ſimilarity of ſentiment. The Americans, from the firſt beginnings of colonization, had been accuſtomed to the doctrines of the old puritans and nonconformiſts, which in many reſpects have a near affinity to the Methodiſtic tenets. The origin of Methodiſm in America

Methodists. rica was seldom, if ever, attended, either under the discourses of Mr Whitefield's or Mr Wesley's preachers, with those ridiculous effects with which it was accompanied in these kingdoms. Most of the preachers, who went over to the continent, having laboured for some years in Europe previous to their having crossed the water, had exhausted their wild-fire; so that their discourses were more scriptural and rational than those of the primitive Methodists. Another reason may be found in the education of the Americans. As a people, they are better cultivated than the body of the English; they are chiefly composed of merchants and a respectable yeomanry: and there is but a small proportion of that class so superabundant here which we distinguish by the name of *mob*.

"The only exception we have heard, to their exemption from the extravagancies which in this country marked the infancy of Methodism, is a custom they have introduced in Maryland and Virginia. Frequently, at the conclusion of a sermon, the whole congregation begin to pray and to praise God aloud. The uproar which this must create may easily be conceived. Some, we are told, are great admirers of this species of enthusiasm, in which every man is his own minister, and one sings and another prays, with the most discordant devotion. But we will not dignify such indecency with such a name. Its proper appellation is *fanaticism*. We hope, that, for the future, religion will never appear in this country under so odious a form; and greatly is it to be lamented, that, among the friends of Christianity, any such absurdities should arise, to furnish infidels with occasions of triumph."

Our author informs us, that the occupation of the Methodist preachers in America was very laborious. In the course of the day they frequently rode 20 or 30 miles, preaching twice or thrice, and sometimes to considerable congregations. Notwithstanding this labour, however, few or none of them ever thought of returning to Britain. Several reasons may be assigned for the pleasure they took in this laborious exercise. "Their excursions (says Mr Hanson) thro' immense forests abounding in trees of all sorts and sizes, were often highly romantic. Innumerable rivers and falls of water; vistas opening to the view, in contrast with the uncultivated wild; deer now shooting across the road, and now scouring through the woods, while the eye was frequently relieved by the appearance of orchards and plantations, and the houses of gentlemen and farmers peeping through the trees; formed a scenery so various and picturesque, as to produce a variety of reflection, and present, we will not say to a philosophic eye, but to the mind of every reasonable creature, the most sublime and agreeable images.

"Their worship partook of the general simplicity. It was frequently conducted in the open air. The woods resounded to the voice of the preacher, or to the singing of his numerous congregations; while their horses, fastened to the trees, formed a singular addition to the solemnity. It was indeed a striking picture; and might naturally impress the mind with a retrospect of the antediluvian days, when the hills and valleys re-echoed the patriarchal devotions, and a Seth or an Enoch, in the shadow of a projecting rock, or beneath the foliage of some venerable oak, delivered his primeval lectures, and was a "preacher of righteousness to the people." Methodists.

The American hospitality is supposed by Mr Hanson to have been another reason for the assiduity of the Methodist teachers, as well as the consciousness of being well employed, and the satisfaction resulting from considerations of public utility. As many of the preachers were men of fervent piety, this reflection would have its full weight; and the instruction of the ignorant and the reformation of the profligate would be considered as the best recompence of their labours. Spreading themselves through the continent, they took in Nova Scotia, Georgia, with the principal places in both Carolinas, Virginia, Maryland, Delaware, Pennsylvania, New Jersey, and New York; numbering upwards of 43,000 members of their society, exclusive of about 80 itinerants, and a considerable number of local preachers, who took no circuits, but assisted occasionally in the neighbourhood of their respective residence.

The large and expensive buildings which the colonists have erected for public worship, almost exceed credibility; and several colleges are founded for the instruction of youth. How far the proposed plan of uniting genuine religion and extensive learning will be carried into execution, time only can discover. It must materially depend on the character of the presidents and tutors, and the provision that shall be made for their support. Men of real erudition will never be procured at low salaries; and it is in vain to attempt establishments of this sort without a liberal provision for the professors in every branch of science. Two of these places are called *Cokesbury* and *Wesley Colleges*. How they are endowed, or whether they propose to obtain authority to confer degrees, we are not informed. But perhaps they are rather schools than colleges; which indeed is a circumstance to be wished, as good grammar-schools are of the utmost service to the progress of literature.

The great success which attended the Methodist preachers in America naturally determined Mr Wesley to try the West India islands. The Moravians had already attempted to establish their principles in some of these islands; and in 1786 some preachers were sent from the Methodists in England to the West Indies. In many of these they met with success. Societies were formed in Barbadoes, St Vincent's, Dominica, St Christopher's, Nevis, Antigua, St Eustatius, Tortola, and St Croix, amounting in all to near 5000 persons. At this time the whole number of Methodists in America and the West Indies amounted to about 48,302. These societies consist both of whites and blacks: on the continent they were mostly whites, but in the islands negroes. "But it is to be observed (says Mr Hanson) that the subjection of the negroes, and the obedience in which they are trained, must inculcate a docility peculiarly favourable to the purposes of a mission." Some of the missionaries went also to St Vincent's, where they met with some success, and have established some schools, in which their children are carefully instructed in the principles of religion.

"In January 1789 (says our author), Dr Coke paid a visit to Jamaica, and gave them several ser-

Methodists. mons. As he made but a short stay, it could hardly be considered as a fair trial. Should a mission be established here, as well as in the other islands, which will probably be the case, it is hoped, it will be the means of correcting one vice at least, and that is duelling; a savage relict of Gothic barbarity, by which all the islands have for many years been distinguished. Perhaps too it will give some check to the spirit of luxury and dissipation; and teach the planters, if it be found impracticable to emancipate their slaves, at least to treat them with humanity."

It has been debated among the leading men of the Methodistical profession, whether the cause might not be served by sending missionaries to the East Indies and to Africa; but these projects were dropped, as there was no invitation, nor any prospect of success if it had been adopted. A mission has been formed to the new settlement called *Kentucky*, on the confines of the Indian territories, near the Mississippi. The danger of the missionaries at the time they undertook this service was certainly very great; yet such was their zeal for the cause, that they voluntarily offered themselves: but we are not yet informed what success they have met with.

While Methodism was thus making rapid progress in America, its teachers were equally indefatigable in Britain. A most remarkable particular, however, occurs with regard to Mr Wesley himself; for though he had gone to Georgia, as has been already related, to convert the Indians to Christianity, yet on his return to England in 1738, he took it into his head that he, their teacher, was not yet converted: the reason was, that he had not the faith of assurance. This, however, was not long wanting. He arrived in England on the first day of February, and was blest with the assurance on the sixth of March following. This was immediately announced to the public; and the consequence, if we may believe him, was, that God then began to work by his ministry, which he had not done before. Being joined by one Kinchin, a fellow of Corpus, they travelled to Manchester, Holms-Chapel, Newcastle in Staffordshire, and other places, where they preached, exhorted, and conversed on religious subjects, in public-houses, stables, &c. sometimes meeting with success and sometimes not. During this peregrination Mr Wesley certainly displayed a great deal of superstition, which we must undoubtedly suppose to have been communicated to his hearers, and to have caused them act on many occasions in a very ridiculous manner. An instance follows:—"The next day (says he), March 11th, we dined at Birmingham, and, soon after we left it, were reproved for our negligence there (in letting those who attended us go without either exhortation or instruction) by a severe shower of hail!" About the latter end of March or beginning of April he and his companion began to pray *extempore*, leaving off entirely the forms of the church of England, to which he had formerly been so devoted. The doctrine of instantaneous conversion, which his imagination had suggested to him as a work performed on himself, was greatly received by some of his hearers, and all the converts to the new doctrine confirmed themselves, and contributed greatly to persuade others by declarations of their *experiences*, as they called them: however, though a knowledge of the saving assurance had been given on March 6th, he does not date his conversion sooner than May 24th of the same year.

This new doctrine of an instantaneous, and in fact miraculous impulse, though greatly relished by the enthusiastical part of the society, was very much disliked by others, particularly Mr Charles Wesley his brother, who warned him of the mischief he was doing; though he himself was soon converted, and, what is very astonishing, two days before John Wesley himself. The particulars related of these miraculous conversions are truly disgraceful, and could not but bring into contempt the society which consisted of such enthusiasts. "Many (says Mr Hanson) are represented as falling suddenly to the ground, in horror and agony not to be conceived, and rising again with equal expressions of peace and consolation."—Their conversions were usually attended with these violent symptoms; and, for several years, few meetings occurred where Mr Wesley presided, without one or more instances of the same kind. It was not possible that such transactions should pass without notice. The confusion that too often prevailed, the emotions of the persons affected, and the exultations of the rest, which were severally animadverted upon, gave great and general offence. Many insisted, that it must either be occasioned by the heat of the rooms, and the agitation of the animal spirits under discourses of the most alarming nature; or that it was mere artifice and hypocrisy.

In the mean time, two of the sons of a Mrs Hutton in London, happening to become converts to the new doctrine, this lady was so much offended, that she wrote to Mr Samuel Wesley, informing him, that she was of opinion his brother John had lost his senses; and requesting, that the next time he came to his house, he, Mr Samuel, would either confine or convert him. All that could be done, however, to prevent the progress of the new doctrine was insufficient; and the first Methodist society was formed in London, on the first of May 1738, when about 50 agreed to meet together once a-week for free conversation, begun and ended with singing and prayer.

All this time, however, it seems that the conversion of Mr Wesley was far from being so complete as that of many of his hearers. He had preached and converted others, while he himself was absolutely unconverted. The knowledge of the true saving faith was only revealed to him on the 6th of March, and he did not experience its power till the 24th of May; and even after this, his doubts and fears were still so great, that on the 13th of June he undertook a voyage to Germany, where, in the company of Count Zinzendorff, his faith seems to have been thoroughly confirmed.

On Mr Wesley's return, September 16th, 1738, he applied himself with the greatest assiduity and success to the propagation of his doctrine. Multitudes of converts were made in various parts of the kingdom; and the reproaches poured upon him by his opponents, seemed to have rendered his zeal more fervent if possible than before. It is remarkable, however, that some of his old friends were now so much offended with his conduct or his principles, that they absolutely refused to keep company with him. His original

Methodiſts. original plan ſeems to have been, to make an union of clergymen, and diſſeminate his principles by their means. But in this he ſucceeded ſo ill, that in a letter written in 1742, he wiſhed for a clerical aſſiſtant, were he only in deacons orders: but adds, "I know of none ſuch, who is willing to caſt in his lot with us; and I ſcarce expect I ſhall, becauſe I know how faſt they are rivetted in the ſervice of the devil and the world before they leave the univerſity."—Finding at laſt that nothing could be done with them, he was obliged to have recourſe to lay preachers; and eaſily ſelected thoſe who appeared to have the greateſt talents for prayer and exhortation in the private meetings appointed for that purpoſe. Thus he at once raiſed himſelf to be the head of a ſect; as the lay-preachers willingly yielded obedience to him who had the advantages of ſuperior learning and abilities, and was beſides in orders as a clergyman; and this obedience he did not fail on every occaſion to exact.

If his doctrine had formerly given offence to the eſtabliſhed clergy, the appointment of lay preachers was reckoned much worſe; and their being appointed without any form of ordination whatever, which almoſt all of them were, ſubjected them to contempt and reproach, which their want of learning, and very often of natural abilities, did not contribute to remove. Thus finding the churches ſhut againſt him and his followers, he was obliged to preach in the fields, and made his firſt eſſay in this way on the ſecond of April 1739, in the neighbourhood of Briſtol; Mr Whitefield having ſet him an example the day before.

The ſucceſs of thoſe ignorant and itinerant preachers, with their abſurd and uncharitable diſcourſes and behaviour, ſo provoked their adverſaries, that a perſecution was ſoon commenced againſt them. Mr Weſley himſelf was calumniated in the harſheſt manner, being ſometimes ſaid to be a Jeſuit, ſometimes an illiterate enthuſiaſt, as the people took it into their heads. Many pretended to anſwer him in writing, without being able to do ſo: the conſequence was, that their deficiency of argument was ſupplied by invective, and the moſt ſcandalous performances made their appearance. Some of the Engliſh clergy ſo far forgot themſelves as to inſtigate the mob againſt them, and the moſt cruel outrages were committed upon them in various places. For ſome time the perſecuted party adhered to the doctrines of paſſive obedience and non-reſiſtance, which their inhuman adverſaries did not fail to take the advantage of.—The leſs they were oppoſed, the more inſolent they became. The Methodiſts were frequently in danger of their lives. Men, women with child, and even children, were knocked down and abuſed with the ſame undiſtinguiſhing fury. Houſes were ſtripped of their furniture, vaſt quantities of furniture carried off, feather-beds cut in pieces and ſtrewed over the ſtreets, ſeveral reputable people were forced into the army, &c. To the diſgrace of magiſtracy alſo it was found, that when application was made to the juſtices of the peace, redreſs was commonly denied; nor was a ſtop put to theſe ſhameful proceedings without a royal mandate for the purpoſe.

From the year 1738 to 1747 Mr Weſley and his itinerants were employed in various parts of England. In 1747 he went over to Dublin, where a ſociety had been formed by one Mr Williams a clergyman.—Here they proved ſo ſucceſsful, notwithſtanding the number of Papiſts, and the violence of their other opponents, that in 1750 they had erected meeting-houſes in every part of the kingdom, and had formed 29 circuits, which employed 67 itinerants, beſides a conſiderable number of local preachers. An invitation was given to Mr Weſley, in 1751, to viſit Scotland, by an officer in quarters at Muſſelburgh. He accordingly took a journey thither the ſame year; but left the place, after preaching in it once or twice. In 1753 he returned to Scotland, and viſited Glaſgow. Societies were at length formed in that city, as well as at Edinburgh, Dundee, Aberdeen, Inverneſs, and a few other places: but his ſucceſs was by no means equal to what it had been in other parts; for in 1790 the number of circuits in Scotland was no more than eight, which were ſupplied by 20 itinerants.

Mr Whitefield, the other great labourer in the vineyard, was equally indefatigable, and probably more ſucceſsful than Mr Weſley. Before entering into orders, he had formed a ſociety of religious perſons at Glouceſter: here he preached his firſt ſermon on the Neceſſity and Benefit of Religious Society; here he became extremely popular, as well as at Briſtol and London, while preparing to ſet ſail for Georgia for the firſt time; and in all places to which he came, large collections were made for the poor. He maintained the ſame doctrine with Mr Weſley as to the new birth; which likewiſe gave offence to the clergy when delivered by him, as it had done with Mr Weſley. In the various intervals of his voyages to America, he employed himſelf with the very ſame aſſiduity in Britain and in Ireland, which we have already taken notice of in the weſtern continent. His ſucceſs was every where prodigious. In 1741 he was invited to Scotland, and preached his firſt ſermon there at Dunfermline. From thence he went to Edinburgh, and preached in ſeveral of the eſtabliſhed churches, but differed with Meſſrs Ralph and Ebenezer Erſkines; ſo that he, as well as Mr Weſley, proved unſucceſsful in forming a coalition with any other religious party. In the private way, however, his ſucceſs was very conſiderable, at Edinburgh, Glaſgow, Aberdeen, Dundee, and other places. In 1742 he paid a ſecond viſit to Scotland, and a third one in 1748. In 1751 he viſited Ireland for the firſt time; and preached to great multitudes without being moleſted, even in places where others had been mobbed. From thence he returned to Scotland the ſame year, and ſpeaks in very favourable terms of the attention the people there paid to their bibles. In 1752 and 1753 he again viſited the ſame kingdom, and the laſt time diſtinguiſhed himſelf by preaching againſt the playhouſe in Glaſgow. In 1756 he returned; and by his animated diſcourſes at Edinburgh againſt Popery and arbitrary power, was owned to have contributed very much to the increaſe of courage and loyalty in this country. Next year he again viſited the Scottiſh capital during the time that the General Aſſembly ſat, and his ſermons were attended by ſeveral of the members. At Glaſgow he made a large collection for the poor of that city, and from thence took a

Methodists. a voyage to Ireland. He was received with the usual affection by the lower classes of Protestants; but the Popish rabble, exasperated at his success, almost murdered him with stones. After passing through a great part of Ireland, visiting England and Wales, he paid another visit to Scotland, where four clergymen now lent him their pulpits. His last visit was in the summer of 1758, where his congregations were as large as ever; and it is to his endeavours principally that we are to ascribe the great number of Methodist societies now existing in Scotland.

With regard to the religious principles of the Methodists, we cannot enter into any particular detail; neither indeed are there any doctrines peculiar to all included under that name, except the single one of salvation by faith without works. In March 1741, Mr Whitefield being returned to England, entirely separated from Mr Wesley and his friends, "because he did not hold the decrees."—Here was the first breach, which warm men persuaded Mr Whitefield to make, merely for a difference of opinion. Those indeed who believed universal redemption, had no desire at all to separate: but those who held particular redemption, would not hear of any accommodation, being determined to have no fellowship with men that "were in such dangerous errors." So there were now two sorts of Methodists so called; those for particular, and those for general, redemption.

History of Methodism, &c.

Not many years passed, before William Cudworth and James Relly separated from Mr Whitefield.—These were properly Antinomians, absolute avowed enemies to the law of God, which they never preached or professed to preach, but termed all *Legalists* who did. With them, preaching the law was an abomination. They had nothing to do with the law. They would preach Christ, as they called it; but without one word either of holiness or good works. Yet these were still denominated *Methodists*, although differing from Mr Whitefield both in judgment and practice, abundantly more than Mr Whitefield did from Mr Wesley.

In the mean time, Mr Venn and Mr Romaine began to be spoken of: and not long after Mr Madan and Mr Berridge, with a few other clergymen, who, although they had no connection with each other, yet preaching salvation by faith, and endeavouring to live accordingly, to be Bible-Christians, were soon included in the general name of *Methodists*. And so indeed were all others who preached salvation by faith, and appeared more serious than their neighbours. Some of these were quite regular in their manner of preaching: some were quite irregular, (though not by choice; but necessity was laid upon them, they must preach irregularly, or not at all): and others were between both; regular in most, tho' not in all particulars.

In 1762, George Bell and a few other persons began to speak great words. In the latter end of the year they foretold that the world would be at an end on the 28th of February. Mr Wesley, with whom they were then connected, withstood them both in public and private. This they would not endure: so, in January and February 1763, they separated from him, under the care of Mr Maxfield, one of Mr Wesley's preachers. But still Mr Maxfield and his adherents, even the wildest enthusiasts among them, go under the general name of *Methodists*, and so bring a scandal upon those with whom they have no connection.

At present, those who remain with Mr Wesley are mostly Church-of-England men. They love her articles, her homilies, her liturgy, her discipline, and unwillingly vary from it in any instance. Meantime, all who preach among them declare, *we are all by nature children of wrath*, but *by grace we are saved through faith*; saved from both the guilt and from the power of sin. They endeavour to live according to what they preach, to be plain Bible-Christians; and they meet together at convenient times, to encourage one another therein. They tenderly love many that are Calvinists, though they do not love their opinions. Yea, they love the Antinomians themselves; but it is with a love of compassion only, for they hate their doctrines with a perfect hatred; they abhor them as they do hell-fire: being convinced nothing can so effectually destroy all faith, all holiness, and all good works.

We shall conclude this article with the words of Mr Hanson, which must certainly be accounted just, whatever objections may be made to some parts of the principles or behaviour of the Methodists. "If they possess not much knowledge, which, however, we do not know to be the case, it is at least certain, they are not deficient in zeal: and without any passionate desire to imitate their example, we may at least commend their endeavours for the general good. Every good man will contemplate with pleasure the operation of the spirit of reformation, whether foreign or domestic; and will rejoice in every attempt to propagate Christianity in the barbarous parts of the world: An attempt which, if in any tolerable degree successful, will do infinitely more for their civilization and happiness, than all the united energies of those boasted benefactors of mankind, the philosophic infidels."

Methodists (*Methodici*), in the history of medicine, a sect of ancient physicians, who reduced the whole art of healing to a few common principles or appearances. The Methodists were the followers of Thessalus; whence they were also called *Thessalici*. They were strenuously opposed by Galen in several of his writings; who scrupled not to assert, that the methodical heresy ruined every thing that was good in the art.

Quincy mistakenly uses *Methodists (Methodici)* for those physicians who adhere to the doctrine of Galen, and the schools; and who cure with bleeding, purges, &c. duly applied according to the symptoms, circumstances, &c. in opposition to empirics and chemists, who use violent medicines, and pretended secrets or nostrums.

METHODIUS, a father of the church, bishop of Olympus or Patara in Lycia, and afterward of Tyre in Palestine, suffered martyrdom at Chalcis in Greece towards the end of Dioclesian's persecution in the year 302. He composed many works in a clear and elaborate style, which were extant in Jerome's time. Father Combesis collected several considerable fragments of this writer, cited by Epiphanius, Photius, and others;

others; and printed them with notes of his own, together with the works of Amphilochius, and Andreas Cretenfis, in folio, Paris 1644.

METHUSELAH, the fon of Enoch and father of Lamech, was born in the year of the world 687, begat Lamech in 874, and died in 1656, being the very year of the deluge, at the age of 969, which is the greateft age that has been attained to by any mortal man upon earth (Gen. v. 21, 22, &c.) According to the text of the feptuagint, Methufelah muft have lived 14 years after the deluge; and according to other copies, he died fix years before it: but it is generally agreed on, that thefe copies, as well as the feptuagint, are corrupted in this place.

METHYMNA (anc. geog.), a town of the ifland of Lefbos. It was the fecond city of the ifland in greatnefs, population, and opulence. Its territory was fruitful, and the wines it produced excellent. It was the native place of Theophraftus, and of Arion the mufician. When the whole ifland of Lefbos revolted from the power of the Athenians, Methymna alone remained firm to its ancient allies.

METIUS (James), of Alcmaer, in Holland, the inventor of telefcopes with glaffes, one of which he prefented to the States-General in 1609. Tubes, extended, by uniting them, to a great length, were known to the ancients; but Metius was the firft who added glaffes, and he was indebted to chance for the difcovery: he had frequently obferved fome fchoolboys playing upon the ice, who made ufe of their copy books rolled up in the fhape of tubes, to look at each other, to which they fometimes added pieces of ice at each end, to view diftant objects: this led him to the invention of optic glaffes.

METO, a famous mathematician of Athens, 432 B. C. publifhed his *Ennea decaterides*, that is, his "Cycle of Ninteen Years," by which he endeavoured to adjuft the courfe of the fun to that of the moon, and to make the folar and lunar years begin at the fame point of time.

METŒCI, a name given by the Athenians to fuch as had their fixed habitations in Attica, though foreigners by birth. The *metœci* were admitted by the council of Areopagus, and entered in the public regifter. They differed both from the πολιται and ξενοι; becaufe the *politæ* or "citizens" were freemen of Athens, and the *xeni* or "ftrangers" had lodgings only for a fhort time; whereas the *metœci*, though not freemen of Athens, conftantly refided upon the fpot whether they had removed.

METONYMY, in rhetoric, is a trope in which one name is put for another, on account of the near relation there is between them. See ORATORY, n° 51.

METOPE, in architecture, is the interval or fquare fpace between the triglyphs of the Doric freeze, which among the ancients ufed to be painted or adorned with carved work, reprefenting the heads of oxen or utenfils ufed in facrifices.

METOPOSCOPY, the pretended art of knowing a perfon's difpofitions and manners by viewing the traces and lines in the face. Ciro Spontoni, who has written exprefsly on metopofcopy, fays, that feven lines are examined in the forehead, and that each line is confidered as having its particular planet: the firft is the line of Saturn, the fecond of Jupiter, the third of Mars, &c. Metopofcopy is only a branch of phyfiognomy, which founds its conjectures on all the parts of the body.

METRE, μετρον, in poetry, a fyftem of feet of a juft length.

The different metres in poetry, are the different manners of ordering and combining the quantities, or the long and fhort fyllables: thus hexameter, pentameter, iambic, fapphic verfes, &c. confift of different metres or meafures. See HEXAMETER.

The Englifh verfes, the metres are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleafes. The moft ufual are the heroic, generally confifting of five long and five fhort fyllables, and verfes of four feet, and of three feet, and a cæfura or fingle fyllable.

The ancients, by varioufly combining and tranfpofing their quantities, made a vaft variety of different meafures, by forming fpondees, &c. of different feet. See POETRY.

METRETES, a Grecian meafure, containing fomething more than nine Englifh gallons. See MEASURE.

METRICAL VERSES, are thofe confifting of a determinate number of long and fhort fyllables; as thofe of the Greek and Latin poets.—Capellus obferves, that the genius of the Hebrew language is incompatible with metrical poetry.

METRODORUS, a Greek phyfician, born at Chios, was the difciple of Democritus the philofopher, and the mafter of Hippocrates the phyfician and Anaxarchus the philofopher. He maintained that the univerfe is infinite and eternal: but his works are loft. He lived about 444 B. C.

METROCOMIA (from μητηρ *mother*, and κωμη *town* or *village*), a term in the ancient church-hiftory, fignifying "a borough or village that had other villages under its jurifdiction."—What a metropolis was among cities, a *metrocomia* was among country towns. The ancient *metrocomiæ* had each its choriepifcopus or rural dean, and here was his fee or refidence. See METROPOLIS and CHORIEPISCOPUS.

METRONOMI, the name given by the Athenians to five officers in the city and ten in the *piræus*, whofe duty it was to infpect all forts of meafures except thofe of corn. The *piræus* was the greateft mart in Attica.

METROPOLIS (from μητηρ *mother*, and πολις *city*), the capital of a country or province; or the principal city, and as it were mother of all the reft.

The term METROPOLIS is alfo applied to archiepifcopal churches, and fometimes to the principal or mother-church of a city. The Roman empire having been divided into 13 diocefes and 120 provinces, each diocefe and each province had its metropolis or capital city, where the proconful had his refidence. To this civil divifion the ecclefiaftical was afterwards adapted, and the bifhop of the capital city had the direction of affairs, and the pre-eminence over all the bifhops of the province. His refidence in the metropolis gave him the title of *metropolitan*. This erection of metropolitans is referred to the end of the third century, and was confirmed by the council of Nice.

Metulum || Meulen.

A metropolitan has the privilege of ordaining his suffragans; and appeals from sentences passed by the suffragans are preferred to the metropolitan.

METROPOLIS (anc. geog.), a town of Acarnania, a little to the south of Stratos.—Another, of Lydia; situated between Colophon and Priene, near the Cayster.—A third of Phrygia; sacred to the mother of the gods, who was here worshipped.—A fourth Metropolis of Estiotis, a district in Thessaly, to the east of Gomphi, and the last town of that district. *Metropolitæ*, the people.

METULUM (anc. geog.), a considerable city of Liburnia, at the siege of which Octavius Cæsar was wounded. Said to be the metropolis, and situated on two eminences, intersected by a valley (Appian.) Now generally thought to be *Metling* in Carniola. E. Long. 16. N. Lat. 46. 5.

METZ, an ancient, large, and strong town of France, and capital of the territory of Messin, with a citadel, a parliament, and a bishop's see, whose bishop assumes the title of a prince of the empire. The cathedral church is one of the finest in Europe, and the square called *Coslin* and the house of the governor are worth seeing. The Jews live in a part of the town by themselves, where they have a synagogue. The sweetmeats they make here are in high esteem. It is seated at the confluence of the rivers Moselle and Seille. E. Long. 6. 16. N. Lat. 49. 7.

METZU (Gabriel), an eminent painter, was born at Leyden in 1615. His subjects were usually taken from low life; but they were all designed after nature, and surprisingly well represented; such as women selling fish, fowls, or hares; sick persons attended by the doctor; chemists in their laboratories; dead game, painters rooms, shops, and drawing schools hung with prints and pictures; all which subjects he composed well, and finished them with extreme neatness, as he likewise did his portraits. He spent a great deal of time on his pictures, which has occasioned their scarcity and dearness at this time; and besides, it is confidently said, the Dutch prevent their being carried out of their own country, as much as possible. So that those paintings of Metzu, which are sometimes seen in the collections of our kingdoms, are either obtained by chance, or purchased at large prices. Though it ought also to be remembered, that the value set upon the works of this master throughout Holland and Flanders, has induced several painters to endeavour at imitating and copying his works, which having gradually circulated abroad and being a little mellowed by time, are now called originals. He died in 1658.

MEVANIA (anc. geog.), a town of the Cisappenine Umbria; seated at the confluence of the Tina and Clitumnus, on the Via Flaminia, famous for its herds of white cattle brought up there for sacrifice; the white colour said to be owing to the waters of the Clitumnus (Virgil). Mevania was the country of Propertius. *Mevenates* the people. Now said to be *Bevagna*, in the territory of the Pope.

MEULEN (Anthony Francis Vander), painter of battles, &c. was born at Brussels in 1634; and was a disciple of Peter Sneyers, a battle-painter of considerable note. Some of his compositions happening to be carried to Paris, were shown to M. Colbert; who soon discerned the abilities of Vander Meulen, and by his generous offers induced him to leave his native city and settle at Paris. Here he was employed by Louis XIV. and had an appointment of 2000 livres pension, beside being paid for his work. He attended that monarch in most of his expeditions in the field, and designed on the spot the sieges, attacks, encampments, and marches, of the king's armies, also the views of those cities and towns memorable by any degree of success; and from those sketches he composed the paintings, which were intended to perpetuate the remembrance of those military exploits. He died in 1690. The principal works of this master are at Versailles and Marli; but many of his easel pictures are dispersed through England, France, and Flanders.

MEURSIUS (John), a learned and laborious writer, born at Losdun, near the Hague, in 1579. He early discovered a fondness for polite literature and the sciences; and went to study the law at Orleans with the son of Barneveldt, whom he accompanied in his travels. In 1610 he was made professor of history at Leyden, and afterwards Greek professor. In the following year, the magistrates of the United Provinces proved how high their opinion was of his abilities, by fixing on him to write the history of his country. Meursius married in the year 1612. His wife, Anna Catherina Bilberbeccia, descended from a very ancient and noble family in Angermond a city of Pomerania, possessed many amiable qualities, and rendered his domestic life remarkably happy, while he discharged the duties of his professorship with an assiduity equal to his abilities. At the same time the republic of letters did not lose the advantages to be derived from his labours; for during the fourteen years of his residence at Leyden, the works which he published were more numerous than those which had been presented to the world by the whole body of professors from the original foundation of the university in 1575.

Meursius's writings had now disseminated his reputation in every part of Europe; nor had the fame of his diligence and talents as a professor spread with less rapidity. In so high a rank, indeed, did he stand among his literary contemporaries, that Christian IV. king of Denmark conferred on him the place of historiographer royal, and invited him to undertake the professorship of history and politics in the academy of Sora, which was founded by King Frederick II. although the revival of its honours and dignities may be dated from this period, when it seemed to be again founded under the auspices of Christian IV. Meursius and his family left Leyden in the year 1635. On his arrival at Sora, he was received with the most friendly tokens of regard by his Majesty and the Danish nobility, and more particularly by Chancellor Rosenkrantz, on whom he has bestowed very ample praises in one of his letters. Here he resided, equally beloved and admired, for above twelve years. His pupils were not very numerous, but his exertions never relaxed. Those hours likewise which were not devoted to the duties of his professorship, he employed in revising the works of the ancients, and in philological disquisitions.

His health was not much impaired by the intenseness of application; but in the year 1638 he had a violent attack of the stone, from which disorder he had

had suffered severely before. In a letter to Vossius he thus describes his melancholy condition: "The state of my health during the whole of the last winter has been truly deplorable. My sufferings from the stone have been really dreadful. I have voided so many, that the repeated discharges brought on a wound which emitted blood for above four months. I was next attacked by a tertian fever, which increased constantly, and produced an universal lassitude of body, a dejection of spirits, and a total loss of appetite. But, thank heaven, I have now in some measure recovered my strength, and gotten the better of these complaints." He recovered from this attack; but in the following year the disorder returned with redoubled violence, and brought on a consumption which terminated his existence on the 20th day of September 1639. He left behind him a son who was named after him, and one daughter.

So mild were the dispositions of Meursius, that in all his writings he constantly avoided literary disputes. He was sometimes unavoidably drawn into them; but constantly endeavoured to promote a reconciliation, rather than widen any breach, by his replies to the attacks of his adversaries. In his friendships he was firm and affectionate. Of his domestic life, whatever is known has been gathered from his letters. The same easy tranquillity seems to have attended him in every situation. In his family he was particularly fortunate. In his son, to whom he gave his own name, he seemed to behold his own youth renewed. The same application, the same eagerness in the pursuit of knowledge, marked the conduct of this promising young man; who did not long survive his father, but died soon after he had recommended himself to the notice of the learned world by his publications. They were only three in number; but displayed so much solid learning, that they have been assigned to the father, John Meursius, by Labbe Beughem and others. This mistake was occasioned as much by the similitude of their names, as by the nature of their works, and their manner of treating philological subjects.

His works may be divided into four classes, of which each might form a separate volume if they were ever to be republished. Meursius himself indeed, in one of his letters to Vossius, proposes such a division. From that epistle, and from another which the younger Meursius sent to G. I. Vossius, who strongly advised him to republish the whole of his father's writings, and from the collections of his posthumous works which have appeared from Struvius, Groschupsius, Moller, and some others, a catalogue of his works might be formed. Some assistance will also be derived from the indexes published in their respective works, by Hankins, Dessclius, Wettenius, and Bartholinus. The plan which Meursius recommends for publishing his works, is to insert in the first volume all that he has written relative to Athens; in the second, his historical pieces; in the third, his miscellaneous dissertations; and in the fourth, the various authors which he published, with his notes and corrections.

Before we conclude, one mistake with respect to this great scholar, which prevails very generally, must be corrected. A scandalous and indecent work, which is intitled *Meursii elegantiæ Latini sermonis*, and has *Aloisiæ Sigeæ Satyræ Sotadicæ* annexed to it, is very falsely attributed to Meursius; nor indeed are the *Satires* with more reason assigned to Aloisia Sigea, who was a Spanish lady eminent for her piety and virtue. The real author of these infamous productions was Westrenius, an advocate at Copenhagen, who probably assumed the name of Meursius, in order to shield himself from the disgrace which would naturally have attended the writer of such a performance. To insure the sale of his book, however, might have been the principal view of Westrenius. At any rate, such a conclusion may be fairly deduced from the disguised title, and from his desire that the world should affix it to a character so distinguished and respectable in almost every branch of various literature.

MEW, Sea-mew, or *Sea-mall*. See Larus.

Winter-Mew, or *Coddy-moddy*, in ornithology. See Larus.

MEWING, the falling off or change of hair, feathers, skin, horns, or other parts of animals, which happens in some annually, in others only at certain stages of their lives: but the generality of beasts mew in the spring. An old hart casts his horns sooner than a young one, which is commonly in the months of February and March, after which they begin to button in March or April: and as the sun grows strong, and the season of the year puts forth the fruits of the earth, so their heads grow, and are summed full by the middle of June. It is to be observed, that if a hart be gelt before he has a head, he will never have any; and if he be gelt after he has a head, he will never cast his horns; again, if he be gelt when he has a velvet-head, it will always be so, without fraying or burnishing.

Mew || Mexico.

MEXICO, a province of the Spanish empire in America, once a celebrated kingdom, the most powerful and civilized in the New World.

1 Kingdoms into which Mexico was anciently divided.

In former times the country now distinguished by the name of the *Vale of Mexico*, was called *Anahuac*, the rest of it being divided into the kingdoms of *Mexico*, *Acolhuacan*, *Tlacopan*, and *Michuacan*; the republics of *Tlaxcallan*, *Chololan*, *Huexotzinco*, and some other states. Of these the most westerly was Michuacan, which to the east and south had Mexico; on the north the country of the Chichemecas, and some other barbarous nations; on the west the lake of Chapallan, and some independent tribes. It had four considerable cities; the capital being seated on the eastern shore of a beautiful lake named *Pazcuaro*. The kingdom of Tlacopan lay betwixt Mexico and Michuacan, and was of very small extent; its capital was seated on the western border of a lake called *Tezcuco*, four miles westward of that of Mexico. Acolhuacan was the most extensive as well as the most ancient. It was bounded on the east by the republic of Tlaxcallan; on the south by a province of Mexico named Chalco; on the north by the country of the Huaxtecas; and on the west by other states of Mexico, terminating at the lake Tezcuco. Its length from south to north was somewhat more than 200 miles, and its breadth about 60; it was very populous, and had a great many cities. On the eastern bank of the lake of Tezcuco was situated the capital of that territory, 15 miles to the eastward of that of Mexico; and no less celebrated for its antiquity than the politeness and civilization of its inhabitants. Tlaxcallan, or Tlascala, a celebrated republic, had Acolhuacan to the west;

the

the republics of Chollolan and Huexotzinco to the ſouth; and ſome of the Mexican ſtates on the north and eaſt. It was but of ſmall extent; not reaching more than 50 miles in length and 30 in breadth. Its capital ſtood on the ſide of a great mountain, about 70 miles to the eaſtward of Mexico. The kingdom of Mexico, though the moſt modern, came at laſt to be the moſt extenſive of the whole. On the ſouth and ſouth-weſt it extended as far as the Pacific Ocean; on the eaſt it was bounded by the republics of Tlacopan and Michuacan; on the north by the country of the Huextacas; and on the north-weſt by the country of the Chichemecas; the whole being comprehended between the 14th and 21ſt degrees of north latitude, and between 271 and 283 of longitude, computed from the meridian of Ferro.

2 Uncertainty of the origin of the Mexicans.

If the origin of the nations on the eaſtern continent is obſcure, that of the inhabitants of the weſtern continent is much more ſo; and indeed, till very lately, the hiſtory of every one of the American nations, till the arrival of the Spaniards, has been either treated as entirely fabulous, or very ſlightly touched upon by hiſtorians. By the induſtry of the Abbé Franceſco Clavigero, however, we are now furniſhed with an account of the ancient kingdoms juſt enumerated; more full and authentic than could have been expected, conſidering the difficulty there muſt have been of procuring materials.

3 They came from the north.

According to this gentleman, it is undeniable that Mexico was firſt peopled from the more northerly parts of the continent, which for many ages had been filled with inhabitants. Some have ſuppoſed, from the traditions of the natives, and the diſcovery of very large human ſkeletons in many parts of New Spain, that this country was firſt inhabited by giants: but though ſimilar conjectures and diſcoveries have been made in other countries, we are by no means warranted from thence to conclude that the whole human race were formerly of an immenſe ſize; it being moſt probable, as our author obſerves, that the gigantic race were but a few individuals who lived at different times and in different nations.

4 Toltecans the firſt inhabitants.

The Toltecans are the moſt ancient Mexican nation of which we know any thing. They were expelled, as we are told, from their own country (ſuppoſed by Clavigero to have been *Tollan*, to the northward of Mexico) in the year 472; and for ſome time led a migratory and wandering life. In whatever place they determined to reſide for any conſiderable time, they erected houſes and cultivated the ground. Thus their migrations were extremely ſlow, and it was not till 104 years after they ſet out that they reached a place about 50 miles to the eaſtward of the city of Mexico, where they ſettled for 20 years, giving to their new place of reſidence the name of *Tollantzinco*. From thence they proceeded about 40 miles farther to the weſt, where they built a city called, from the name of their country, *Tollan*, or *Tula*.

5 Their hiſtory.

The Toltecans, during their journeys, were conducted by a number of chiefs; who, by the time they arrived at Tollantzinco, were reduced to ſeven, and, after their final ſettlement, the government was changed into a monarchy; but by what means, or on what account, we are not told. Their firſt king began his reign in 667, and their monarchy laſted 384 years, during which time they reckon juſt eight princes. We are not, however, to imagine that each of their kings lived long enough to make up this ſpace. It was a cuſtom among them that the name of the king ſhould be continued for 52 years, and no longer, from the time he aſcended the throne. If he died within that period, the government was carried on in his name by a regency; if he ſurvived, he was obliged to reſign his authority. During the four centuries that the Toltecan monarchy continued, they had increaſed very conſiderably in number, and had built many cities; but when in the height of proſperity, almoſt the whole nation was deſtroyed by a famine occaſioned by drought; and a peſtilence, probably the conſequence of the former. "According to Torquemada (ſays our author), at a certain feſtival-ball made by the *Toltecas*, the *ſad looking* devil appeared to them of a gigantic ſize, with immenſe arms, and in the midſt of the entertainment he embraced and ſuffocated them; that then he appeared in the form of a child with a putrid head, and brought the plague; and, finally, at the perſuaſion of the ſame devil, they abandoned the country of Tula."

Theſe ſtories, according to Clavigero, are taken from the ſymbolical repreſentations or hieroglyphics, by which this piece of hiſtory was repreſented, and which the Spaniſh author has taken literally. Be the cauſe what it will, however, it is certain that the ſurviving Toltecans abandoned their country, and diſperſed themſelves among the ſurrounding nations, where they were well received, on account of their ſuperior knowledge and civilization. They were ſucceeded by the Chichemecas, a much more barbarous people, who came from an unknown country called *Amaquemecan*, where they had for a long time reſided; but of which no traces or remembrance can be found among any of the American nations known to Europeans; ſo that Clavigero ſuppoſes it muſt have been very far to the northward.

6 Succeeded by the Chichemecas.

The motive which the Chichemecas had for leaving their own country is not known. They were eighteen months on their journey, and took poſſeſſion of the deſolate country of the Toltecas about an hundred years after the former had left it. They were much more uncivilized than the Toltecans; but, however, had a regular form of monarchical government, and in other reſpects were leſs diſguſting in their manners than ſome of the neighbouring nations. The laſt king who reigned in Amaquemecan before the departure of the Chichemecas, had left his dominions between his two ſons Auchcauhtli and Xolotl, and the latter conducted the new colony. Having proceeded from the ruins of Tula towards Chempoalla and Tepepolio, Xolotl ſent his ſon to ſurvey the country. The prince croſſed the borders of the lakes and the mountains which ſurround the vale of Mexico; then aſcending to the top of a very high one, he viewed the whole country, and took poſſeſſion of it in the name of his father, by ſhooting four arrows to the four winds.

7 Xolotl firſt king.

Xolotl being informed by his ſon of the nature of the country, choſe for the capital of his kingdom Tenayuca, about ſix miles to the northward of the city of Mexico, and diſtributed his people in the neighbouring territory; but as moſt of them went to the northward, that part obtained the name of the country.

try of the Chichemecas, in diſtinction from the reſt. Here a review of the people was taken, and their number, according to Torquemada, was more than a million. In confirmation of this the hiſtorian adds, that in his time there were ſtill remaining twelve piles of the ſtones they threw to aſcertain their numbers; but Clavigero thinks it improbable that ſo large an army ſhould ſet out on ſo long an expedition, or that ſo ſmall a diſtrict could maintain ſo many hunters.

Xolotl finding himſelf peacefully ſettled in his new dominion, ſent one of his officers to explore the ſources of ſome of the rivers of the country. While performing this taſk he came to the habitations of ſome Toltecans, who it ſeems had ſtill kept together, and were likely once more to become a nation. As theſe people were not inclined to war, and greatly eſteemed for their knowledge and ſkill in the arts, the Chichemecas entered into a ſtrict alliance with them, and Prince Nopaltzin, who had firſt ſurveyed the country, married a Toltecan princeſs. The conſequence of this alliance was the introduction of the arts and knowledge of the Toltecans among the Chichemecas. Till now the latter had ſubſiſted entirely by hunting, and ſuch fruits and roots as the earth ſpontaneouſly produced. They were clad in the ſkins of wild beaſts, and, like theſe beaſts, they are ſaid to have ſucked the blood of the animals they caught; but after their connection with the Toltecans they began to ſow corn, to learn the art of digging and working metals, to cut ſtones, manufacture cotton, and, in every reſpect, to make great improvements.

When Xolotl had reigned about eight years in his new territories, an embaſſy of ſix perſons arrived from a diſtant country not far from *Amaquemecan*, expreſſing a deſire of coming with their people to reſide in the country of the Chichemecas. The king gave them a gracious reception, and aſſigned them a diſtrict; and, in a few years after, three other princes, with a great army of Acolhuans, who were likewiſe neighbours of Amaquemecan, made their appearance. The king was at that time at Tezcuco, to which place he had removed his court: and here he was accoſted by the princes, who, in a ſubmiſſive and flattering manner, requeſted him to allow them a place in his happy country, where the people enjoyed ſuch an excellent government. Xolotl not only gave them a favourable reception, but offered them his two daughters in marriage, expreſſing his concern that he had no more, that none might have been excluded from the royal alliance. On the third prince, however, he beſtowed a noble virgin of Chalco, in whom the Toltecan and Chichemecan blood were united. The nuptials were celebrated with extraordinary pomp; and the two nations, after the example of the ſovereigns, continued to intermarry. As the Acolhuans were the more civilized nation of the two, the name of Chichemecas began to be appropriated to the more rude and barbarous part, who preferred hunting to agriculture, or who choſe a life of ſavage liberty in the mountains to the reſtraints of ſocial laws. Theſe barbarians aſſociated with the Otomies, another ſavage nation who lived to the northward, occupying a tract of more than three hundred miles in extent; and by their deſcendants the Spaniards were haraſſed for many years after the conqueſt of Mexico.

As ſoon as the nuptial rejoicings were over, Xolotl divided his territories into three parts, aſſigning one to each of the princes. Acolhuatzin, who had married his eldeſt daughter, had Azcopazalco, 18 miles to the weſtward of Tezcuco; Chiconquauhtli, who married the other, had a territory named Xaltocan; and Tzontecomatl, who married the lady of inferior rank, had one named Coatlichan. The country continued for ſome time to flouriſh, population increaſed greatly, and with it the civilization of the people; but as theſe advanced, the vices of luxury and ambition increaſed in proportion. Xolotl found himſelf obliged to treat his ſubjects with more ſeverity than formerly, and even to put ſome of them to death.—This produced a conſpiracy againſt him, which, however, he had the good fortune to eſcape; but while he meditated a ſevere revenge on the conſpirators, he was ſeized with the diſtemper of which he died, in the fortieth year of his reign, and in a very advanced age. His corpſe was adorned with various figures of gold and ſilver, and placed in a chair made of gum copal and other precious ſubſtances, where it remained five days, until the lords ſummoned to the funeral attended. The body was then burnt, and the aſhes depoſited in an urn of the hardeſt ſtone. This urn was kept expoſed in the palace for forty days, during which time the nobility attended with lamentations; after which it was carried to a cave in the neighbourhood, with ſimilar demonſtrations of grief.

11 Nopaltzin the ſecond king.

Xolotl was ſucceeded by his ſon Nopaltzin, who at the time of his acceſſion is ſuppoſed to have been about fifty years of age. In his time, the tranquillity of the kingdom, which had begun to ſuffer diſturbance under his father, underwent much more violent ſhocks, and civil wars took place. Alcohuatzin, the only one of the three princes who remained alive, thinking the territory he poſſeſſed too narrow, made war upon the lord of a neighbouring province named Tapotzotlan, and deprived him of his territory. Huetzin, ſon to the late prince Tzontecomatl, lord of Coatlichan, fell in love with the grand-daughter of the queen, a celebrated beauty, but was rivalled by a neighbouring lord, who determined to ſupport his pretenſions by force of arms. Huetzin, however, got the better, defeated and killed his adverſary, and then poſſeſſed himſelf of the lady and his eſtate. This was followed by a rebellion of the whole province of Tollantzinco, ſo that the king himſelf was obliged to take the field. As the rebels were very numerous, the royal army was at firſt defeated: but having at laſt received a ſtrong reinforcement, the rebels were overcome, and their ringleaders ſeverely puniſhed. The king did not long ſurvive the reſtoration of tranquillity to his dominions. He died in the thirty-ſecond year of his reign, and ninety-ſecond of his age, leaving the throne to his eldeſt ſon Tlotzin.

12 Civil wars.

13 Tlotzin.

We are not informed of any particulars relating to this prince farther that he was of an excellent diſpoſition, greatly beloved by his ſubjects, and, though addicted to peace, yet aſſiduous in exerciſing his people in the art of war. He reigned thirty-ſix years, and died of a very painful diſeaſe.

14 Quinatzin a luxurious prince.

Quinatzin, the ſon and ſucceſſor of Tlotzin, proved a vain and luxurious prince. His acceſſion to the throne was celebrated with much greater pomp than any

any of his predeceſſors. Xolotl had removed his court from Tenayuca to Tezcuco; but being diſguſted with this laſt place, on account of the conſpiracy formed againſt him there, he had returned to Tenayuca.—There the court continued till the reign of Quinatzin, who removed it back to Tezcuco. In his paſſage thither, he cauſed himſelf be tranſported in an open chair or litter, carried on the ſhoulders of four of his principal lords, while four others held an umbrella over his head. Before his time the kings had been accuſtomed to walk upon their feet like other people; but this example, once ſet, was quickly followed by all the lords and great people in the kingdom, who now ſtrove to out-do one another in expenſive and oſtentatious grandeur.

15 Diſturbances in various parts.

The reign of Quinatzin, though tranquil at firſt, was ſoon diſturbed by dangerous revolts and rebellions. Theſe firſt broke out in two ſtates, named Maztillen and Totopec, ſituated among the northern mountains. The king, having collected a great army, marched without delay againſt the rebels, and challenged their leaders to come down and fight him in the plain—This challenge being accepted, a furious engagement enſued, in which, though great numbers fell on both ſides, no deciſive advantage was gained by either party. Frequent engagements took place for the ſpace of forty days, until at laſt the rebels, perceiving that their own numbers were daily diminiſhing, without any poſſibility of being recruited like the royal army, made a final ſurrender to the king, who puniſhed the ringleaders with great ſeverity. Tranquillity, however, was not yet reſtored: the rebellion ſpread to ſuch a degree, that the king was obliged not only to take the field in perſon, but to employ ſix other armies, under the command of faithful and experienced generals, to reduce the rebels. Thoſe proved ſo ſucceſsful in their enterprizes, that in a ſhort time the rebellious cities were reduced to obedience, and the kingdom enjoyed the bleſſings of peace during the long reign of Quinatzin, who is ſaid to have ſat on the throne for no leſs than ſixty years. He was ſucceeded by his ſon Techotlatla; but as the affairs of the Acolhuans now began to be connected with thoſe of the Mexicans, it will be proper to give ſome account of that people.

16 Migrations of the Mexicans.

The Mexicans, called alſo the Aztecas, dwelt till the year 1160 in a country called *Aztlan*, ſituated to the north of the gulf of California, as appears by the route they purſued in their journey; but how far to the northward we are not certainly informed. Betancourt makes it no leſs than 2700 miles, and Boturini ſays it was a province of Aſia. The cauſe of their migration is ſaid to have been as follows:

Among the Aztecas was a perſon of great authority, named *Huiztilin*, to whoſe opinion every one paid the utmoſt deference. He had conceived a deſign, for what reaſon we know not, to perſuade his countrymen to change their reſidence; and to effect this he fell upon the following ſtratagem. Having heard, while meditating on his ſcheme, a little bird ſinging on the branches of a tree, the notes of which reſembled the word *Tihui*, which in the Azteca language ſignified "let us go," he took that opportunity to work upon the ſuperſtition of the people. With this view, he took along with him a reſpectable perſon, and made him attend to the note of the bird. "What can it mean (ſays he), but that we muſt leave this country, and find ourſelves another? Without doubt it is the warning of ſome ſecret divinity who watches over our welfare: let us obey, therefore, his voice, and not draw his anger upon us by a refuſal." Tecpaltzin, for that was the name of his friend, readily agreed to the interpretation; and both of them being perſons of great influence, their united perſuaſions ſoon gained over to their project the bulk of the nation; and they accordingly ſet out.

This account, though it has ſomewhat the air of fable, is what the Mexicans themſelves give; and is certainly more worthy of credit than that of the Spaniards, who maintain that the Aztecas ſet out by the expreſs command of the devil. But whatever was their motive, it is certain that they began their migration about the year above-mentioned. Torquemada ſays, that in all the hieroglyphic paintings which record this migration, there is delineated an arm of the ſea, or a great river, which, however, Clavigero takes to be a repreſentation of the univerſal deluge. Boturini ſuppoſes it to have been the gulf of California, over which, he thinks, they tranſported themſelves; but our author controverts this opinion, becauſe there are no remains of the buildings they conſtructed, during their migration, in California as there are in other places. If there really was any river of conſequence which they croſſed, he ſays it muſt have been the *Colorado*, or Red River, which diſcharges itſelf into the gulf of California, in lat. 32°. 3′. Having croſſed this beyond the lat. of 35°, they proceeded towards the ſouth-eaſt, as far as the river *Gila*, where they ſtopped for ſome time; and on the banks of that river there are remains of the great edifices they conſtructed. From thence having reſumed their courſe towards the S.S.E. they proceeedd to lat. 29°. and ſtopped again at a place upwards of 250 miles diſtant from the city of Chihuahua, towards the N. N. W. This place is now known by the name of *Caſe grandi*, on account of a very large building ſtill extant, and univerſally attributed to them by the traditions of the country. It is conſtructed on the plan of thoſe of New Mexico, that is, conſiſting of three floors with a terrace above them, and without any entrance to the under floor. The door for entrance opens to the ſecond floor; ſo that a ſcaling ladder is neceſſary: and the inhabitants of New Mexico build in this manner, in order to be leſs expoſed to the attack of their enemies; putting out the ſcaling ladder only for thoſe to whom they give admiſſion into their houſes. No doubt the Aztecas had the ſame motive for raiſing their edifice on this plan, as every mark of a fortreſs is to be obſerved in it, being defended on one ſide by a lofty mountain, and the reſt ſurrounded by a wall about ſeven feet thick, the foundations of which are ſtill exiſting. In this there are ſtones as big as mill-ſtones; the beams of the roof are of pine, and well finiſhed. In the centre is a little artificial mount, apparently conſtructed with a deſign to keep guard on, and obſerve the enemy. Some ditches have been formed in this place, and ſeveral kitchen utenſils found, as earthen pots, diſhes, and jars, with ſome looking-glaſſes made of a ſtone called *itztli*.

The Atzecas having ſtaid here as long as they thought

Mexico.

thought proper, croſſed the mountains of Tarahumara, directed their courſe ſouthward, and ſtopped again for three years at Culiacan, a place ſituated on the gulf of California, in 24 degrees north latitude. Here they formed a wooden image of a god called *Huitzilopochtli*, whom they imagined to be their tutelar deity, and made a chair of reeds and ruſhes to tranſport it, calling this vehicle *the chair of God.* Four prieſts were choſen, to carry the image on their ſhoulders, whom they called *the ſervants of God;* and the act of carrying it they name *teomama*, which ſignifies "to carry *God* on one's *back*."

The Aztecas, when they left their original habitations, were divided into ſix tribes; but here the Mexicans were left with their god by five of them, viz. the Xochimilcas, Tepanecas, Chalceſe, Tlahuicas, and Tlaſcalans. The cauſe of this ſeparation is not known. The tribes juſt mentioned pretend that it was done at the expreſs command of God; but there can be little doubt that it was occaſioned by ſome diſagreement among themſelves. This is rendered farther probable, when we conſider that on their journey towards Tula, the remaining tribe was divided into two violent factions, which alternately perſecuted one another: neither did they afterwards conſtruct any more edifices. However, they always travelled together, in order to enjoy the company of their imaginary God. At every place where they ſtopped an altar was erected to him; and at their departure they left behind them all their ſick, and probably alſo ſome others to take care of them, or ſuch as were not willing to endure the fatigue of farther journeys. They ſtopped in Tula nine years, and eleven more in the neighbouring parts. At laſt, in 1216, they arrived at Zumpanco, a conſiderable city in the vale of Mexico, where they were received in a very hoſpitable manner by the lord of that diſtrict. He not only aſſigned them proper habitations, but became very much attached to them; and even demanded from among them a wife for his ſon Ilhuicatl. This requeſt was complied with; and from this marriage all the Mexican kings deſcended.

The Mexicans continued to migrate from one place to another along the lake of Tezcuco. Xoltotl, who was then on the throne of the Acolhuans or Chichemechas, allowed them to ſettle in whatever places of his dominions they thought proper; but ſome of them finding themſelves haraſſed by a neighbouring lord, were obliged, in 1245, to retire to Chapoltepec, a mountain on the weſtern borders of the lake, ſcarce two miles diſtant from the ſite of Mexico. This took place in the reign of Nopaltzin; when, as has already been obſerved, diſturbances began to take place in the Acolhuan dominions. The Mexicans, however, did not find themſelves any more ſecure in their new place of reſidence than formerly: they were perſecuted by the neighbouring lords, and obliged to take refuge in a number of ſmall iſlands, named *Acolco*, at the ſouthern extremity of the lake of Mexico. Here for 52 years they lived in the moſt miſerable manner that can be imagined; ſubſiſting on fiſh, inſects, roots, &c. and clothing themſelves with the leaves of the amoxtli, which abounds in that lake.

In this miſerable plight the Mexicans continued till the year 1314, when they were all reduced to a ſtate of the moſt abſolute ſlavery. This was done by the king of a petty ſtate named Colhuacan: but there are different accounts of the manner in which it was effected. Some ſay that this prince, unwilling to allow the Mexicans to maintain themſelves in his territories without paying tribute, made war upon them, ſubdued and enſlaved them. Others affirm, that, pretending compaſſion for their miſerable ſituation, he offered them a more commodious place of reſidence. The Mexicans accepted the offer with great pleaſure; but had ſcarcely ſet out to take poſſeſſion of their new place of reſidence when they were attacked by the Colhuans, made priſoners, and carried off for ſlaves.

20
They regain their liberty in conſequence of a monſtrous piece of cruelty.

After ſome years a war broke out betwixt the Colhuans and Xochimilcas; in which the latter gained ſuch advantages, that they were obliged to employ their ſlaves to aſſiſt them. They accordingly ordered them to prepare for war, but without furniſhing them with arms neceſſary for a military enterpriſe; ſo that the Mexicans were obliged to content themſelves with long ſtaves, having their points hardened in the fire: they alſo made knives of the ſtone itztli, and ſhields of reeds woven together. They agreed among themſelves not to waſte their time, as was uſual, in making priſoners, but to content themſelves with cutting off one ear of their enemies, and then leaving them without farther injury. They adhered punctually to this reſolution; and ruſhing furiouſly upon the Xochimilcas, cut off an ear from as many as they could, killing thoſe who ſtruggled to ſuch a degree that they could not effect their purpoſe. In ſhort, ſo well did the Mexicans acquit themſelves in this engagement, that the Xochimilcas not only abandoned the field, but were obliged to take refuge among the mountains. After the battle, the Colhuan ſoldiers preſented themſelves before their general with the priſoners they had taken; for it was by the number of theſe, not of the enemy left dead on the field, that they judged of their valour. The Mexicans had taken only four, and theſe they kept concealed for the abominable purpoſe of ſacrificing them. The Colhuans, therefore, ſeeing no trophies of their valour, began to reproach them with cowardice; but the Mexicans, producing their baſkets of ears, deſired them to judge from theſe how many priſoners they might have taken, had they not been unwilling to retard their victory by taking up time in binding them.

Notwithſtanding the valour diſplayed by the Mexicans in this engagement, it doth not appear that their haughty maſters were in the leaſt mollified or inclined to afford them eaſier terms than before. Having erected an altar to their god, they demanded of their lord ſomething precious to offer in ſacrifice to him; but he in diſdain ſent them a dirty cloth, incloſing the filthy carcaſe of a vile bird. This was carried by Colhuan prieſts; and without any ceremony laid upon the altar. The Mexicans, with apparent unconcern, removed this filthy offering, and put in its place a knife made of itztli, and an odoriferous herb. On the day of conſecration, the Colhuan prince failed not to attend with his nobility; not with a view to do honour to the feſtival, but to make a mockery of the Mexicans. Their deriſion, however, was ſoon changed into horror, when the Mexicans, after a ſolemn dance, brought forth the four Xochimilcan priſoners they had taken; and, after having made them dance a little, cut open their

21
The firſt human ſacrifice in Mexico.

Mexico.

their breafts with the knife which lay on the altar, and plucking out their hearts, offered them, while yet warm and palpitating with life, to their diabolical idol. This horrible facrifice had fuch an effect upon the fpectators, that both king and fubjects defired the Mexicans immediately to quit their territories and go where they pleafed. This order was inftantly obeyed: the whole nation took their rout towards the north, until they came to a place named *Acatzitzintlan*, fituated betwixt two lakes, and afterwards named *Mexicaltzinco*; but for fome reafon or other, being difcontented with this fituation, as indeed they feem very often to have been, they proceeded to *Iztacalco*, ftill nearer to the fite of Mexico. Here they formed the image of a little mountain of paper, and danced round it a whole night, finging their victory over the Xochimilcas, and returning thanks to their god for having freed them from the yoke of the Colhuas. Clavigero is of opinion, that by this mountain they reprefented Colhuacan, as in their pictures it was always reprefented by a hunch-backed mountain; and this is the literal fignification of the name.

22
They fettle at laft on the iflands on which Mexico was built.

Having ftaid two years in Iztacalco, they came to a place on the lake where they found a nopal or opuntia growing in a ftone, and over it the foot of an eagle. All the Mexican hiftorians fay that this was the mark given them by their oracle of the place where they were finally to fettle. Here, then, they put an end to their wanderings; and, as foon as they had taken poffeffion of the fpot, an altar was erected to the god, or rather devil, whom they worfhipped. The altar was confecrated in a manner conformable to the cruel religion which thefe people had adopted. Having at that time no prifoners among them, one of their number went out in queft of fome animal for a victim; but happening to meet with a Colhuan, a quarrel enfued; and the Mexican proving victorious, bound his enemy, brought him home, and prefented his heart to the idol. Around this altar they now began to build their habitations; which, like the celebrated city of Rome, confifted at firft of a parcel of miferable rufh huts; as they were then furnifhed with no better materials. Their city, if fuch it might be called, was named *Tenochtitlan*, and afterwards *Mexico*, which name afterwards prevailed; and, according to Clavigero, fignifies the place of *Mexitli* or *Huitzilopochtli*, their god of war: and in this refpect alfo the founding of Mexico was fimilar to that of Rome, the latter being protected by *Mars* their god of war, as the Mexicans were by *Mexitli*.

23
Their miferable fituation at firft.

The city of Mexico was founded in the year 1325, in the moft incommodious fituation we can imagine, viz on a fmall ifland named Tenochtitlan, in the middle of a great lake, without ground to cultivate for their fubfiftence, or even room fufficient to build their habitations. Their life was therefore as miferable here for fome time as it had been when they were on the iflands at the end of the lake, and they were reduced to the fame fhifts to maintain themfelves. To enlarge the boundaries of their ifland, they drove palifades into thofe parts of the water which were moft fhallow, terracing them with ftones and turf, and uniting to their principal ifland feveral other fmaller ones which lay in the neighbourhood. To procure to themfelves afterwards ftones, wood, &c. for conftructing their habitations, as well as clothing and other neceffaries, they inftituted a commerce with the people who dwelt on the borders of the lake, fupplying them with fifh, water-fowl, and other more minute inhabitants of the lake and marfhes, which they contrived to render eatable; and in return for all this they received the neceffaries above-mentioned. The greateft effort of their induftry, however, was the conftruction of floating gardens, by means of bufhes and mud of the lake; and thefe they brought to fuch perfection that they produced maize, pepper, chia, French beans, and gourds.

For thirteen years that the Mexicans had to ftruggle with extreme difficulty, they remained at peace; but no fooner did they begin to profper and live comfortably, than the inveterate enmity betwixt the two factions formerly mentioned broke out in all its fury. This produced a feparation; and one of the parties took up their refidence on a fmall ifland at a little diftance to the northward, which, from an heap of fand found there, they at firft named *Xaltilolco*, but afterwards *Tlatelolco*, from a terrace conftructed by themfelves. This ifland was afterwards united to that of Tenochtitlan.

24
The factions feparate.

About this time the Mexicans divided their city into four parts, a divifion which ftill fubfifts; each quarter having now its tutelar faint, as it had formerly its tutelar god. In the midft of their city was the fanctuary of their great god *Mexitli*, whom they conftantly preferred to all the reft. To him they daily performed acts of adoration: but inftead of making any progrefs in humanity, they feem to have daily improved in the moft horrible barbarities, at leaft in their religion. The dreadful facrifices made of their prifoners already mentioned, could only be exceeded by that which we are now about to relate. Being now on a more refpectable footing than formerly, they fent an embaffy to the petty king of Colhuacan, requefting him to fend them one of his daughters, that fhe might be confecrated the mother of their protecting god. The unfufpecting prince, intoxicated with the thoughts of having his daughter made a goddefs, readily complied with their defire.—The unfortunate princefs was conducted in great triumph to Mexico; but no fooner was fhe arrived, than fhe was facrificed in the fhocking manner above related; and, to add to the horror of the deed, the body was flayed, and one of the braveft young men of the nation dreffed in her fkin. Her father, ignorant of this dreadful tranfaction, was invited by the Mexicans to be prefent at the apotheofis of his daughter, and went to fee the folemnity, and to worfhip the new divinity. He was led into the fanctuary, where the young man ftood clothed in the bloody fkin of his daughter; but the darknefs of the place prevented him from feeing what was before him. They gave him a cenfer in his hand, and fome copal to begin his worfhip: but having difcovered by the flame of the copal the horrible fpectacle, he ran out in a diftracted manner, calling upon his people to revenge the injury; but this they were not able to do at that time nor ever after. Hiftorians are unanimous, that this facrifice was performed at the exprefs command of the devil; and indeed in this inftance, their credulity feems pardonable; though Clavigero, with more reafon, afcribes it to his priefts.

25
Monftrous barbarity of their religion.

In

In the year 1352 the Mexican government was changed from an ariſtocracy to a monarchy. At firſt they were governed by 20 lords, of whom one had an authority ſuperior to the reſt. This naturally ſuggeſted the idea of monarchy; and to this change they were alſo induced by the contemptible ſtate in which their nation ſtill continued, thinking that the royal dignity would confer upon it a degree of ſplendor which otherwiſe it could not enjoy; and that by having one leader, they would be better able to oppoſe their enemies. Proceeding, therefore, to elect a king, the choice fell upon Acamapitzin, a man of great eſtimation among them, and deſcended from Opochtli a noble Atzecan, and a princeſs of the royal family of Colhuacan. As he was yet a bachelor, they attempted to negociate a marriage, firſt with the daughter of the lord of Tacuba, and then of the king of Azcapozalco: but theſe propoſals being rejected with diſdain, they applied to Acolmiztli lord of Coatlichan, and a deſcendant of one of the three Acolhuan princes; who complied with their requeſt, and the nuptials were celebrated with great rejoicings.

In the meantime, the Tlatelolcos, the natural rivals of the Mexicans, reſolved not to be behind them in any thing which had the leaſt appearance of augmenting the glory of their ſtate. They likewiſe, therefore, choſe a king; but not thinking proper to chooſe him from among themſelves, they applied to the king of the Tepanecas, who readily ſent them his ſon; and he was crowned firſt king of Tlatelolco in 1353. In this the Tlatelolcos ſeem to have had a deſign of humbling their rivals, as well as rendering themſelves more reſpectable; and therefore it is probable, that they had repreſented the Mexicans as wanting in that reſpect due to the Tepanecan monarch, as having elected a king without his leave, though at the ſame time they were tributaries to him. The conſequence of this was, that he took a reſolution to double their tribute. Hitherto they had paid only a certain number of fiſh and water-fowl; but now they were ordered to bring alſo ſeveral thouſands of fir and willow plants to be ſet in the roads and gardens of Azcapozalco, and to tranſport to the court a great floating garden, which produced vegetables of every kind known in Anahuac. This being accompliſhed with great difficulty, the king commanded them next year to bring him another garden, with a duck and ſwan in it both ſitting upon eggs; but ſo, that on their arrival at Azcapozalco the brood might be ready to hatch. This was alſo done; and the prince had the ſatisfaction of ſeeing the young birds come out of the eggs. The third year they were ordered to bring a live ſtag along with a garden. This was more difficult than any of the former taſks; becauſe they were obliged, in order to hunt the ſtag, to go to the mountains of the continent, where they were in danger of falling into the hands of their enemies; however, this alſo was accompliſhed, and the deſire of the king gratified.

In this manner the Mexicans were oppreſſed for no leſs than 50 years. They freed themſelves, however, from all their difficulties by vigorous exertions, abſurdly aſcribing to the protection of that malevolent being whom they worſhipped the glory of every deliverance. Acamapitzin governed this city, which at that time comprehended the whole of his dominions, for 37 years in peace. His queen being barren, he married another wife, but without abandoning the firſt; and theſe two, inſtead of being rivals to one another, lived together in the utmoſt harmony; the firſt wife taking upon herſelf the charge of educating *Huitzilihuitl*, the ſon of the ſecond. He had, beſides, ſeveral children by other women, and one named *Itzcoatl*, who afterwards proved one of the beſt and moſt renowned kings who ſat on the throne of Mexico. He is ſaid alſo to have conquered four conſiderable cities; but Clavigero thinks he muſt in this only have been an auxiliary, it being very improbable, that while he could ſcarce maintain his own territories, he ſhould think of foreign conqueſts.

Acamapitzin died in 1389, greatly lamented by the Mexicans, and his death was followed by an interregnum of four months. As the deceaſed monarch had formally reſigned his authority into the hands of his nobles, it was neceſſary that a new election ſhould take place; and when this was done, the choice fell upon Huitzilihuitl, the ſon of Acamapitzin. As he was ſtill unmarried, it was reſolved, if poſſible, to procure him an honourable and advantageous match. With this view, a deputation of nobility was ſent to the king of Azcapozalco, requeſting, in very humble terms, an alliance with one of his daughters. The expreſſions made uſe of by theſe ambaſſadors are ſaid by our author to have been particularly elegant in the Mexican language: but it is difficult to underſtand how a ſpeech made among a people ignorant of the art of writing could be particularly recorded at the interval of ſome hundreds of years after. They are as follow: "We beſeech you, with the moſt profound reſpect, to take compaſſion on our maſter and your ſervant Huitzilihuitl, confined among the thick ruſhes of the lake.—He is without a wife, and we without a queen.—Vouchſafe, Sir, to part with one of your jewels or moſt precious feathers. Give us one of your daughters, who may come to reign over us in a country which belongs to you."

29 Huitzilihuitl the ſecond king.

This piece of oratory had ſuch an effect upon the king, that he granted their requeſt, and a Tepanecan princeſs was conducted in great triumph to Mexico, where the marriage was ſolemnized with the utmoſt joy. Though this princeſs brought him a ſon the firſt year of their marriage, the king, in order to ſtrengthen himſelf by freſh alliances, married alſo the daughter of another prince, by whom he had Montezuma *Ilhuicamina*, the moſt celebrated of all the Mexican kings.

30 Marries a daughter of the king of the Tepanecans.

We muſt now return to the hiſtory of the Acolhuans, who at this time were governed by Techotlala the ſon of Quinatzin. For 30 years this prince enjoyed an uninterrupted tranquillity. This was interrupted by the revolt of Tzompan, prince of Xaltocan, and the laſt of the family of Chiconquauhtli, one of the three original Acolhuan princes, who had drawn into his conſpiracy the ſovereigns of ſix other ſtates. The king, out of reſpect to the quality of the rebel, offered to pardon him if he would lay down his arms; but Tzompan, confident of his ſtrength, rejected the offer with contempt. The king was therefore obliged to ſend an army againſt him,

31 Reign of Techotlala king of Acolhuan.

Mexico.

in which the Tepanecans and Mexicans served as auxiliaries. The war lasted only two months; Tzompan was defeated and put to death, along with several others of the principal rebels. The Mexicans, who had behaved with great valour, returned in triumph to their city, while Techotlala took several very prudent measures to strengthen his government, prevent rebellions in future, and to augment the splendor of his throne.

In consequence of the renown acquired in this war by the Mexicans, and the advantages resulting from the alliance with the king of Azcapozalco, that people now began to be held in much higher estimation by their neighbours than before. They extended their commerce, and in consequence of that, came to wear cotton instead of the threads of the wild-palm, which had formerly constituted their whole dress: but this gleam of prosperity was soon overcast, and they had to encounter a more inveterate and formidable enemy than any that they had yet met with. This was Maxtlaton prince of Coyoacan, and son to the king of Azcapozalco. Being of a cruel and revengeful temper, for which he was dreaded even by his father, he resolved to resent the indignity which he pretended to have been done to him by the marriage of his sister to the king of Mexico. The true cause of his displeasure, however, was his fear that the Tepanecan crown might devolve on his sister's son by Huitzilihuitl; and to prevent this, he took the barbarous method of sending assassins to murder his nephew. The king of Mexico was not then able to resent the injury; for though, by his marriage with the Tepanecan princess, the oppressive tribute was taken off, and the Mexicans had only to pay a couple of ducks annually, by way of acknowledging the Tepanecan superiority, yet the one nation was far from being in a condition to cope with the other.—The barbarity of Maxtlaton was not unknown to his father; but it is certain that he did not resent it; and indeed there is great reason to suppose that he took part with his son in most of his wicked enterprises.

32
Maxtlaton an inveterate enemy to the Mexicans.

As the Mexicans advanced in wealth and power, so did their rivals the inhabitants of Tlatlelolco.—Their first king died in 1390, leaving his subjects greatly improved in civilization, and the city much enlarged and beautified. The rivalship which subsisted between the two cities had indeed greatly contributed to the aggrandizement of both. The Mexicans had formed so many alliances by marriage with the neighbouring nations, had so much improved their agriculture, and floating gardens on the lake, and had built so many more vessels to supply their extended commerce and fishing, that they were enabled to celebrate their secular year, answering to A. D. 1402, with greater magnificence than they had ever done since they left their original country of Atztlan.

33
Unfortunate reign of Techotlala's son.

All this time Techotlala continued to reign in Acolhuacan; but being now very far advanced in years, and finding his end approach, he called to him his son Ixtlilxochitl, and recommended to him to beware of the ambitious disposition of the king of Azcapozalco, as he was apprehensive that he might attempt something against the peace of the empire. His suspicions were verified; for on the death of Techotlala, which happened in 1406, the king of Azcapozalco, without making the usual submissions to the new king, to whom he was a feudatory, set out for his own territories, with a view to stir up the other feudatory princes to rebellion. Having called to him the kings of Mexico and Tlatleloco, he told them, that Techotlala, who had long tyrannized over that country, being dead, he designed to procure freedom to the princes, so that each might rule his own territory entirely independent of the king of Acolhuacan; but for this purpose he needed their assistance, and trusted to their well known spirit to take part with him in the enterprise. He informed them likewise, that in order to ensure success, he would find means to unite other princes in the confederacy.

The new king of Acolhuacan, in the mean time, was employed in settling the affairs of his kingdom, and endeavouring to gain the good will of his subjects. The combination against him was soon discovered: but though Ixtlilxochitl was desirous of heading his army in person, he was dissuaded from so doing by his courtiers; so that the conduct of the war was committed to his generals. To weaken the enemy, they ravaged the territories of six revolted states; but notwithstanding this, and the superior discipline of the royal army, the war was carried on by the rebels with great obstinacy, their armies being constantly recruited by fresh troops in proportion to their losses. At last, after three years of a ruinous war, the king of Azcapozalco, finding that his resources would at last fail him, sued for peace; but with a design of accomplishing by treachery what he had not yet been able to do by force. His adversary, equally reduced with himself, consented to a peace, though he knew very well that the Tepanecan prince intended to observe it no longer than suited his purpose.

3[4]
Chimalpopoca the king of Mexico.

In the year 1409 died Huitzilihuitl king of Mexico, who likewise left the right of electing a successor to the nobility. They made choice of his brother Chimalpopoca; and from thence it became an established law to choose one of the brothers of the deceased king, or if he had no brothers to elect one of his grandsons. While the new prince was endeavouring to secure himself on the throne, the treacherous Tezozomoc used all means in his power to strengthen the party he had formed against the king of Acolhuacan. In this he was attended with such success, that the unfortunate prince found himself reduced to the necessity of wandering among the neighbouring mountains, at the head of a small army, accompanied by the lords of Huexolta and Coatlichan, who remained always faithful to him. The Tepanecans distressed him to such a degree, by intercepting his provisions, that he was forced to beg them of his enemies. One of his grandsons was sent to Otompan, a rebel state, to request them to supply their king with the provisions he stood in need of, and to exhort them to abandon the cause of the rebels, which they had espoused. No task could be more dangerous; yet such was the magnanimity of the young prince's disposition, that he readily set out on the journey; nor was he deterred by the information he got that there were in the place certain Tepanecans who had come on purpose to publish a proclamation from Tezozomoc. He went boldly to the most public place of the town, and in presence of those who

3[5]
Distress and death of the king of Acolhuacan.

xico.

who publiſhed the proclamation made known his requeſt. This heroiſm, however, did not meet with the ſucceſs it deſerved. His propoſitions were derided from the moment they were made; but the people did not offer any farther inſult, until one of the meaner ſort threw a ſtone at him, exciting others of the ſame ſtamp to put him to death. The Tepanecans, who had hitherto continued ſilent, perceiving their opportunity, joined in the general cry to kill the prince, and began alſo to throw ſtones. The prince attempted firſt to defend himſelf, and afterwards to eſcape by flight; but, both being equally impoſſible, he fell under a ſhower of ſtones. The Tepanecans exulted in this act of treachery, and ſoon after cut off Ixtlixochitl himſelf, after having treacherouſly perſuaded him to a conference with two of their captains. This perfidious act was committed in ſight of the royal army, who were too weak to revenge it: the royal corpſe was ſaved with difficulty; and *Nezahualcojotl*, heir apparent to the crown, was obliged to ſhelter himſelf among the buſhes from the fury of his enemies.

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Tezozomoc having now in a great meaſure gained his point, proceeded to pour down his troops upon thoſe cities and diſtricts which had remained faithful to the late unfortunate monarch. The people made a moſt deſperate defence, and killed vaſt numbers of their enemies; but at laſt being themſelves reduced by the calamities of war, and in danger of total extermination, they were obliged to quit their habitations and fly to other countries. The tyrant, then, finding himſelf ſuperior to all his adverſaries, gave Tezcuco in fief to Chimalpopoca king of Mexico, Huexotla to Tlacacotl king of Tlatelolco; placing faithful governors in other places, and appointing Azcapozalco, the capital of his own territory, the royal reſidence and capital of Acolhuacan.

Prince Nezahualcajotl was preſent in diſguiſe at this diſpoſal of his dominions, along with ſeveral other perſons of diſtinction who were enemies of the tyrant; and ſo much was he tranſported with paſſion, that it was with difficulty he could be reſtrained from killing Tezozomoc on the ſpot, though this would certainly have been done at the expence of his own life. All the reſt of the Acolhuacan empire ſubmitted; and Nezahualcojotl ſaw himſelf for the preſent deprived of all hopes of obtaining the crown.

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Tezozomoc had now attained the ſummit of his ambition: but inſtead of conciliating the minds of his new ſubjects, oppreſſed them with new taxes; and being conſcious of the precarious ſituation in which he ſtood, and tormented with remorſe on account of his crimes, fell into melancholy, and was haunted with frightful dreams. In one, he imagined that Nezahualcojotl, transformed into an eagle, had eat out his heart; and in another, that, in the ſhape of a lion, he licked his body and ſucked his blood. Terrified by theſe viſions, he called his three ſons, Tajatzin, Teuctzintli, and Maxtlaton, enjoining them to put to death Nezahualcojotl as ſoon as they could get it done without being publicly known. He himſelf ſurvived his dreams only about a year. He was now become ſo old, that his body no longer retained its natural heat. He was therefore obliged to be covered up with cotton in a great cradle, not being able to ſit erect in a chair. In this miſerable condition, however, he never forgot his tyranny nor cruelty. From his cradle he iſſued oppreſſive laws relating to the Acolhuacans; and almoſt with his laſt breath renewed his commands with regard to Nezahualcojotl. At laſt he expired in the year 1422, leaving the crown to his ſon Tajatzin.

Mexico.

38
The throne uſurped by Maxtlaton.

Tezozomoc was no ſooner dead than Maxtlaton, without paying the leaſt regard to his father's will, began to exerciſe the functions of a ſovereign. Though it was the right of Tajatzin to invite to his father's funeral whom he pleaſed, Maxtlaton took that upon himſelf. Nezahualcajotl, though not invited, came among the reſt; but though Teuctzintli, brother to Maxtlaton, inſiſted upon his being put to death, the latter oppoſed it, as it could not then be done privately, and he hoped to find another opportunity. No ſooner were the funeral ceremonies over, however, than Maxtlaton behaved in ſuch a manner to his brother Tajatzin, that the prince thought proper to retire to Chimilpopoca king of Mexico, to whom he had been particularly recommended by his father, in order to have his advice. This monarch, agreeable to the character of that age and people, adviſed him to invite his brother to an entertainment, and then murder him. Unluckily for them both, this diſcourſe was overheard by a ſervant, who in expectation of a reward informed the tyrant of what he had heard: but inſtead of this, Maxtlaton, pretending to diſbelieve his ſtory, drove the informer from his preſence with ignominy. Notwithſtanding this pretence, the tyrant had not the leaſt doubt of the truth of what was told him; and therefore determined to rid himſelf of his brother without delay. This he ſoon accompliſhed in the very ſame way that had been projected againſt himſelf. Tajatzin, along with the king of Mexico, Tlatelolco, and ſome other feudatory princes, were invited by Maxtlaton to an entertainment. The king of Mexico prudently excuſed himſelf, but the unſuſpecting Tajatzin fell into the ſnare. He came to the place of entertainment, and was inſtantly put to death. The company were greatly alarmed; but Maxtlaton, having explained to them his reaſons for ſo doing, they not only excuſed him, but proclaimed him king; to which it is not to be doubted that their fears greatly contributed.

39
Tajatzin murdered.

Though the king of Mexico eſcaped a ſudden death by his abſence at this time, it was only to periſh in a more ſlow and ignominious manner. The vengeance of Maxtlaton firſt appeared by ſending him a woman's dreſs in return to the preſent he ſent him as a feudatory; which being a reflection upon his courage, was the higheſt affront that could be offered him. This inſult, however, was quickly followed by one of a much higher nature. Having heard that one of the Mexican princes's wives was an extraordinary beauty, he enjoined ſome Tepanecan ladies, who were accuſtomed to viſit that princeſs, to invite her to ſpend ſome days with them at Azcapozalco. This being complied with, the tyrant eaſily got an opportunity of raviſhing her, and then ſent her back to her huſband. Chimilpopoca was ſo much affected by this misfortune, that he reſolved to offer himſelf up a ſacrifice to his god. Maxtlaton, however, was reſolved that

40
Miſerable fate of the king of Mexico.

Mexico.

that he ſhould not have even this ſatisfaction. At the very time of the ceremony therefore he ſent a body of troops; who entering Mexico without reſiſtance, carried off the king alive, to the aſtoniſhment of the multitude; and who probably were ſo much confounded by this unexpected adventure, that they did not think of making any reſiſtance.

Chimilpopoca being carried priſoner to Azcapozalco, was confined in a ſtrong wooden cage, the common priſon for criminals. Maxtlaton ſtill was not ſatisfied: he wiſhed to get into his hands Nezahualcajotl; and with this view ſent a meſſage to him, pretending that he was willing to come to an agreement with him reſpecting the kingdom of Acolhuacan. Though the prince was well aſſured of the tyrant's treacherous intentions, he went boldly to his palace, preſented himſelf before him, and told him that he had heard of the impriſonment of the king of Mexico; he had heard alſo that he wiſhed to take away his own life; he deſired him to do ſo, and to gratify his malice. Maxtlaton was ſo ſtruck with this ſpeech, that he aſſured the prince he had not formed any deſign againſt his life; and that he neither had put to death the king of Mexico, nor would do ſo. He then gave orders for his being properly entertained, and even allowed him to pay a viſit to the king of Mexico in priſon. The unfortunate Chimilpopoca, after reciting his misfortunes, requeſted the prince not to return to court, where they would certainly fall upon ſome project for taking away his life; and having pathetically recommended to him the care of his ſubjects, made him a preſent of a gold pendant and ſome other jewels he wore; after which they took a laſt farewell.

41
He is viſited in priſon by Nazahualcajotl.

Chimilpopoca languiſhed in priſon for ſome little time after the departure of Nezahualcojotl; but life became at laſt ſo intolerable to him, that he hanged himſelf in his girdle. His voluntary death, in ſpite of all that the tyrant had done to prevent it, ſo exaſperated the latter, that he reſolved upon the death of the prince at all events, whether in the way recommended by his father or not; to which it is not improbable that he was likewiſe inſtigated to this by certain predictions of the prieſts. He ſent out four captains, therefore, with a ſmall party of troops, in queſt of the fugitive prince, with orders to kill him as ſoon as they overtook him. Theſe meſſengers of death ſet out directly for Tezcuco, where the prince happened to be at that time playing at foot-ball; for he ſpent great part of his time in ſuch diverſions, that he might remove all ſuſpicions of his aſpiring to the throne; and thus he had an opportunity of carrying on his negociations without moleſtation. As he knew the errand on which the Tepanecan captains came, he left off his play on their appearance, and retired to his inner apartment. On being informed that they inquired for him, he ſent for anſwer that he would wait upon them after they had repoſed and refreſhed themſelves. The prince made uſe of this opportunity to quit the houſe, and retire by a ſecret door; or, according to Torquemada, by a kind of labyrinth which he had conſtructed, and through which none but himſelf knew the way. He then fled to Coatlichan, a ſmall ſettlement of weavers, who were all exceedingly attached to him. He was purſued thither by the aſſaſſins, who had been informed by a countryman of the road he had taken; but ſuch was the inviolable fidelity of the inhabitants, that ſeveral of them ſuffered themſelves to be put to death rather than diſcover the place of his concealment. Leaving this place, therefore, they went thro' the country in queſt of him; and no ſooner were they gone, than the prince ſet out in a way directly contrary to that which they had taken. Being purſued in all directions, however, he was in the utmoſt danger, and would once have been made priſoner if ſome countrymen had not concealed him under an heap of chia. Having eſcaped this danger, he went to a pleaſant villa at Tezcotzinco, belonging to his anceſtors; where he was met by ſix lords who had left their ſtates. Having conſulted with them, it was determined to apply to the Chalceſe, although they knew that they were an unfaithful and treacherous people, and had been concerned in the death of the late king. He was then met by ambaſſadors from the Cholulans, who offered him their aſſiſtance againſt the uſurper. In a ſhort time he was joined by numbers of others; ſo that he was not only no longer in danger of his life, but began to be formidable to his enemies.

42
Adventures of that prince.

In the mean time, the Mexicans, who had ſuffered many injuries ſince the death of Chimilpopoca, raiſed to the throne Itzcoatl, the ſon of Acamapitzin by a ſlave, and who was accounted the moſt prudent, juſt, and brave, of all the Mexican nation. His election was no leſs pleaſing to Nezahualcajotl and his party, than it was offenſive to Maxtlaton. An alliance was quickly concluded between the exiled prince and the king of Mexico; and this was ſoon followed by the commencement of hoſtilities on the part of the former. His firſt enterpriſe was againſt the city of Tezcuco, which he determined to take by aſſault, but was prevented by the ſubmiſſion of the inhabitants. He put to death, however, all the officers eſtabliſhed by the tyrant; and all the Tepanecans he found there. The very ſame day another large city named Acolman was furiouſly attacked by a detachment of his army; great numbers put to the ſword, and among the reſt the governor, who was brother to Maxtlaton; and the ſame day alſo Coatlichan was taken by the Chalceſe.

43
Itzcoatl raiſed to the throne of Mexico who aſſiſts Nezahualcajotl.

The Mexican monarch, hearing of the ſucceſſes of his ally, ſent an embaſſy to congratulate him upon them. His ambaſſador was a ſon of king Huitzilihuitl, named *Montezuma*, who for his invincible courage and great qualities was ſurnamed the *man of great heart and the archer of heaven*. The journey was extremely dangerous; but Montezuma undertook it without any fear, accompanied by another nobleman. They got in ſafety to the place where the prince was; but had the misfortune to be taken priſoners, and were carried to Chalco; the lord of which city, named Toteotzin, was an inveterate enemy to the Mexicans. By him he was immediately put in cloſe confinement, under the care of one Quateozin, who was inviolably attached to the Mexican intereſt. Orders were given to the latter to provide no ſuſtenance for the priſoners but what was preſcribed by his lord, until the mode of death which they were to ſuffer ſhould be determined. Toteotzin then, with a view to flatter the Huexotzincas, ſent his priſoners to them, that they might be ſacrificed there if they thought proper. Theſe people, however, rejected the propoſal with diſdain; on which Toteotzin,

44
Dangerous embaſſy undertaken by Montezuma.

Mexico.

zin, thinking to regain the favour of Maxtlaton, notwithſtanding his treachery in abandoning his cauſe, informed him of the priſoners he had in his poſſeſſion. But Maxtlaton (whoſe character ſeems not to deſerve all the reproaches with which it is loaded) called him a double-minded traitor, and commanded him inſtantly to ſet the priſoners at liberty. Before this anſwer arrived, however, Quateozin had inſtructed the priſoners how to make their eſcape, and directed them alſo not to return by land leſt they ſhould again be intercepted, but to embark at a certain place, and proceed by water to Mexico. They followed his advice exactly; and having got to the place to which they were directed, arrived ſafely at their city, to the great ſurpriſe and joy of the inhabitants.

Maxtlaton ... ces againſt Mexico.

Toteotzin, enraged at the loſs of his priſoners, put Quateozin to a cruel death, deſtroying alſo all his family excepting one ſon and a daughter; of whom the latter fled to Mexico, where ſhe was highly honoured on her father's account. Maxtlaton, too, notwithſtanding his generoſity to the priſoners (which Clavigero derives from mere oppoſition to Toteotzin), prepared to wage a formidable war with the Mexicans, who had agreed to unite their troops with thoſe of the prince. The Mexican populace, terrified at engaging ſo powerful an enemy, demanded that their king ſhould ſubmit and beg for peace. So great was the tumult, that the king himſelf was obliged to conſent; and it required the utmoſt exertions of Montezuma's eloquence to perſuade the people to agree to a commencement of hoſtilities. This being done at laſt, the king next called together the chief nobility, and aſked which of them would have the courage to carry an embaſſy to the king of the Tepanecans? This adventure appeared ſo hazardous, that all of them kept a deep ſilence until Montezuma declared himſelf willing to undertake the arduous enterpriſe. He was ordered to propoſe peace to Maxtlaton, but to accept of no diſhonourable conditions; to which he punctually adhered. Maxtlaton refuſed to give any immediate anſwer, but promiſed to give one next day, after he had conſulted his nobility. Montezuma, dreading ſome treachery if he ſtaid all night, promiſed to return next day; which he did, and was told that Maxtlaton had determined upon war. Montezuma then performed the ceremony of challenging him, by preſenting him with certain defenſive weapons, anointing his head, and fixing feathers upon it, as was cuſtomary to do with dead perſons. Laſtly, he proteſted, in the name of his maſter, that as Maxtlaton would not accept of the offered peace, he and all the Tepanecans would infallibly be ruined. Maxtlaton ſhowed not the leaſt ſign of diſpleaſure, but gave Montezuma arms in like manner to preſent to the king of Mexico; and directed him, for his perſonal ſecurity, to return in diſguiſe through a ſmall outlet from the palace. Montezuma followed his advice; but as ſoon as he found himſelf out of danger, began to inſult the Tepanecan guards; and though they ruſhed violently upon him, he not only eſcaped from their attacks, but killed one or two of them.

On his return to Mexico, the populace were again thrown into the utmoſt conſternation by the news that war was inevitable, as the chiefs of the two nations had challenged one another. They now requeſted the king to allow them to retire from their city, of which they ſuppoſed the ruin to be certain. The king encouraged them with the hopes of victory. "But if we are conquered (replied they), what will become of us?" "If that happens (anſwered the king), we are that moment bound to deliver ourſelves into your hands, to be made ſacrifices at your pleaſure." "Be it ſo (replied they), if we are conquered; but if we obtain the victory, we and our deſcendants are bound to be tributary to you; to cultivate your lands and thoſe of your nobles; to build your houſes; and to carry for you, when you go to war, your arms and baggage."

46 He is defeated and killed.

Matters being thus ſettled, intelligence was ſent to prince Nezahualcajotl to repair with his army to Mexico, which he did without delay; and the day after his arrival a furious engagement took place. The Tepanecan army was commanded by a general named *Mazatl*; Maxtlaton himſelf not judging it proper to quit his capital. The ſoldiers on both ſides fought with the utmoſt bravery; but towards night the Mexicans, diſheartened by ſeeing the army of their enemies continually increaſing in number, began once more to loſe their courage and talk of ſurrendering. The king, greatly concerned, aſked Montezuma what ſhould be done to diſſipate the fears of the people? That brave prince replied, that they muſt fight till death; that if they died with their arms in their hands, it would be honourable; but to ſurvive their defeat, would be eternal ignominy. Nothing could be more ſalutary than this advice at ſo critical a juncture: for the Mexicans were already begun to implore the mercy of their enemies, and to promiſe to ſacrifice their chiefs, whoſe ambition had brought the whole nation into ſuch a dilemma. On hearing this, the whole body of nobility, with the king and Montezuma at their head, aſſaulted the enemy ſo furiouſly, that they repulſed them from a ditch of which they had taken poſſeſſion; after which, Montezuma, happening to encounter Mazatl the Tepanecan general, ſtruck him ſuch a blow on the head that he fell down lifeleſs. Thus the Mexicans were inſpired with freſh courage, and their enemies proportionally diſpirited: however, they retired for that night to the city, in ſome hopes of being able to retrieve their fortune next day. Maxtlaton encouraged them by every method in his power; but fortune proved ſtill more unfavourable than the day before. The Tepanecans were now entirely defeated, and the city of Azcapozalco taken. Maxtlaton, who ſeems not to have had the courage to fight, had not now the preſence of mind to fly. He attempted indeed to hide himſelf; but being quickly diſcovered, he was beaten to death with ſticks and ſtones. The city was plundered, the inhabitants butchered, and the houſes deſtroyed by the victors.

47 The Tepanecans entirely reduced.

This victory proved deciſive in favour of the confederates. Every other place of ſtrength in the country was quickly reduced, until the Tepanecans, finding themſelves on the verge of deſtruction, ſent an humble embaſſy to the king of Mexico, requeſting to be taken under his protection, and to become tributaries to him. Itzcoatl received them graciouſly; but threatened them with total extirpation if they violated the fidelity they had ſworn to him. Thus the whole Tepanecan nation was ſubjected to the Mexicans, excepting

Mexico.

cepting only the ſtate and city of Cojohuacan, which continued refractory for a conſiderable time.

Itzcoatl, after this extraordinary ſucceſs, took care to have the above mentioned contract ratified between the nobility and common people, by which the latter were bound to perpetual ſervices. Thoſe who had diſcouraged the ſoldiers in time of battle were baniſhed for ever from the ſtate of Mexico; while Montezuma and others who had diſtinguiſhed themſelves by their bravery, were rewarded with lands, as was uſual with other conquerors.

48 Nezahualcajotl made king of Acolhuacan.

Itzcoatl, now finding himſelf firmly ſeated on the throne of Mexico, ſet about performing his engagements to the Acolhuacan prince, by ſeating him on the throne of his anceſtors. Having again joined their armies, they marched againſt Huaxotla, a city which refuſed to ſubmit even though terms of pardon were offered them. Inſtead of this, they raſhly ventured a battle, in which they were entirely defeated; and were then fain to ſend a deputation of their old men, pregnant women, &c. as was cuſtomary in caſes of diſtreſs, to move the enemy to compaſſion. At laſt all obſtacles being removed, Nezahualcajotl was ſeated on the throne of Acolhuacan, the auxiliary troops were diſmiſſed, and Itzcoatl left at liberty to purſue his conqueſts, in which he was ſtill aſſiſted by the king of Acolhuacan. The firſt expedition was againſt Cojohuacan and other two Tepanecan cities, who had not only refuſed ſubmiſſion themſelves, but excited others to ſhake off the yoke alſo. The war againſt them proved bloody. Three battles were fought, in

49 Conqueſts of the Mexicans.

which Itzcoatl gained no other advantage than making the enemy retreat a little; but in the fourth, while the two armies were hotly engaged, Montezuma, with a body of choſen troops, which he had placed in ambuſcade, attacked the rear-guard of the rebels with ſuch vigour, that they were ſoon diſordered, and obliged to fly to the city. The conquerors purſued them thither; and Montezuma perceiving that they intended to fortify themſelves in the greater temple, fruſtrated their deſign by getting poſſeſſion of it and burning the turret. By this diſaſter they were ſo much terrified, that they fled to the mountains ſouth of Cojohuacan; but even there the royal army overtook and purſued them more than 30 miles, till they came to another mountain, where, quite exhauſted with fatigue, and ſeeing no means of eſcape, they were obliged to ſurrender at diſcretion.

Having thus happily accompliſhed the conqueſt of Cojohuacan and the other rebellious cities, the two kings returned to Mexico. Itzcoatl gave great part of the Tepanecan country to *Totoquihuatzin*, with the title of king of *Tacuba*, a grandſon of Tezozomoc, but who does not appear to have been any way con-

50 Alliance between the kings of Mexico, Acolhuacan, and Tepaneca.

cerned in his projects againſt the Mexicans. An alliance was then formed among the three kings on the following terms: The king of Tacuba held his crown on condition of ſerving the king of Mexico with all his troops, at any time when required; for which he was to have a fifth part of the ſpoils taken from the enemy. The king of Acolhuacan was likewiſe to aſſiſt the king of Mexico in war; and for this he was to have a third part of the plunder, after deducting the ſhare of the king of Tacuba; and the remainder was to belong to the king of Mexico. The kings of Tacuba and Acolhuacan were both declared honorary electors of the kings of Mexico; the real electors being four nobles: and the king of Mexico was likewiſe bound to aſſiſt in the wars of his allies whenever it was demanded.

After having thus ſettled matters among themſelves, and rewarding their ſoldiers, Itzcoatl ſet out with Nezahualcajotl for Tezcuco, where the Acolhuacan king was crowned with all poſſible ceremony. Here the new king took every method which prudence could ſuggeſt to eſtabliſh his authority on a permanent baſis; but while he was thus employed, the Xochimilcas, fearing leſt the Mexicans might conquer their country as they had done that of the Tepanecans, held a council on what was to be done to prevent ſuch a diſgrace. In this council it was determined to commence hoſtilities againſt that riſing ſtate, before it ſhould become more formidable by new conqueſts.

51 Other conqueſts.

Itzcoatl was no ſooner informed of this determination, than he ſent Montezuma with a great army againſt them. The Xochimilcas met him with one ſtill more numerous; but being worſe diſciplined, they were quickly defeated, and their city taken in a very ſhort time after. This conqueſt was followed by the reduction of Cuitlahuac, ſituated on a ſmall iſland on the lake of Chalco. Their inſular ſituation gave them confidence to attack the formidable power of the Mexicans. The king was ſo ſenſible of the difficulty of this enterpriſe, that he propoſed to attack them with the whole force of the alliance: Montezuma, however, with only a ſmall number of men of his own training, whom he furniſhed with proper veſſels, reduced them in ſeven days.

Theſe conqueſts were followed by the reduction of the cities of Quauhnahuac, Quantitlan, and Toltitlan; the firſt of which was ſo ſtrong, that Itzcoatl was obliged to call in his allies to his aſſiſtance. In ſhort, in the ſpace of twelve years, Mexico, from being a contemptible and tributary ſtate, became able to command thoſe whom it had formerly ſerved, and who thought themſelves very much ſuperior in every reſpect.

52 Montezuma I. king of Mexico.

Itzcoatl died in the year 1436, at a very advanced age, in the height of proſperity, and was ſucceeded by Montezuma I. the greateſt monarch that ever ſat on the Mexican throne. Before his coronation, in order to comply with the barbarous rites of his religion, he made war upon the Chalceſe in order to procure the priſoners who were to be ſacrificed at his coronation; and ſcarce was this ceremony over, than a new war commenced, which terminated in the deſtruction of that city. This quarrel happened between the Chalceſe and the Tezcucans. Two of the royal princes of Tezcuco having gone a-hunting on the mountains which overlook the plains of Chalco, while employed in the chace, and ſeparated from their retinue, with only three Mexican lords, fell in with a troop of Chalceſe ſoldiers; who, to gratify the cruelty of their maſter, carried them all priſoners to Chalco. The cruel and inconſiderate tyrant who commanded there inſtantly put them all to death; after which he cauſed their bodies to be ſalted, dried, and placed in an hall of his palace, where they ſerved as ſupporters to the pine torches burned there for light every evening. The king of Tezcuco, overwhelmed with

with grief, and to the laſt degree exaſperated at ſuch an inhuman act, called for the aſſiſtance of the allied kings. The city was attacked at once by land and water. The inhabitants, knowing that they had no mercy to expect, fought like men in deſpair. Even the old tyrant who commanded them, though unable to walk, cauſed himſelf to be carried in a litter among the combatants; notwithſtanding which they were totally defeated, and the moſt ſevere vengeance executed upon them.

Montezuma, on his return, found himſelf obliged to encounter an enemy more formidable on account of his vicinity, than more powerful ones at a diſtance. This was the king of Tlateloleo, who had formerly conſpired againſt the life of Itzcoatl; and finding himſelf diſappointed in this, had tried to reduce his power by entering into a confederacy with ſome of the neighbouring lords. At that time his deſigns proved abortive, but he reſumed them in the time of Montezuma; the conſequence of which was, that he was defeated and killed. One *Moquihuix* was choſen in his room; in whoſe election it is probable that Montezuma had a conſiderable ſhare. This was followed by conqueſts of a much more important nature. The province of *Cuihixcas*, lying to the ſouthward, was added to his dominions, comprehending a tract of country more than 150 miles in breadth; then, turning to the weſtward, he conquered another named *Tzompahacuan*. This ſucceſs, however, was for a ſhort time interrupted by a war with Atonaltzin, lord of a territory in the country of the Mixtecas. This prince, puffed up on account of the great wealth he poſſeſſed, took it into his head that he would allow no Mexican to travel through his country. Montezuma ſent ambaſſadors to know the reaſon of ſuch ſtrange conduct; but Atonaltzin gave them no other anſwer than ſhowing them ſome part of his wealth, making a preſent to the king, and deſiring him from thence to obſerve how much the ſubjects of Atonaltzin loved him; and that he willingly accepted of war, which was to determine whether he ſhould pay tribute to the Mexicans or the Mexicans to him. Montezuma having informed his allies of this inſolent anſwer, ſent a conſiderable army againſt Atonaltzin, but had the mortification to be informed of its defeat; in conſequence of which the pride of Atonaltzin was increaſed to a great degree. Montezuma, greatly chagrined at this firſt check, determined to head his next army in perſon; but before he could call together another, Atonaltzin had drawn into a confederacy with him the Huexotzineas and Tlaſcalans, who were glad of the opportunity, as they ſuppoſed, of reducing the power of the Mexicans. Their numbers, however, availed but little; Montezuma in the very firſt engagement totally defeated the confederate army. The allies of Atonaltzin were particularly unfortunate; for ſuch of them as were not killed in the field of battle, were deſtroyed by their own party out of revenge for the unfortunate event of the battle.

By this victory the Mexican monarch became maſter not only of the dominions of Atonaltzin, but of many other neighbouring princes, againſt whom he made war on account of their having put to death ſome Mexican merchants or couriers without any juſt cauſe. The conqueſt of *Cuetlachtlan* or *Cotaſta*, however, which he attempted in 1457, proved a much more difficult taſk. This province lies on the coaſt of the Mexican gulph, and had been formerly inhabited by the Olmecans, whom the Tlaſcalans had driven out. The inhabitants were very numerous; but dreading the power of Montezuma, called in thoſe of Tlaſcala, together with the Huexotzineas, to their aſſiſtance. Along with theſe the allies drew the Cholulans alſo into the confederacy; ſo that this appears to have been the moſt formidable combination that had yet been formed againſt the Mexican power. Montezuma collected an excellently equipped army; which, however, he did not on this occaſion command in perſon. It contained a great number of perſons of very high rank, among whom were three princes of royal blood, and *Moquihuix* king of Tlateloleo already mentioned. The combination of the three republics againſt Mexico was not known at court when the army ſet out; but Montezuma, being informed of it ſoon after, ſent an order to his generals to return. This accorded ſo ill with the romantic notions of valour entertained by the Mexicans, that a conſultation of the generals was held whether they ſhould obey it or not. At laſt it was determined that the king's order ſhould be obeyed; but no ſooner was this agreed to than Moquihuix accuſed them all of cowardice, and threatened, with his own troops, unaſſiſted, to go and conquer the enemy. His ſpeech had ſuch an effect upon them all, that they went to meet the confederates. The Cotaſteſe fought with great valour, but were unable to reſiſt the royal forces; and their allies were almoſt totally deſtroyed. Six thouſand two hundred of them were taken priſoners, and ſoon after ſacrificed to the Mexican god of war in the barbarous manner already deſcribed. The victory was ſaid to have been owing principally to the valour and good conduct of Moquihuix, inſomuch that to this day a ſong made in his praiſe on that occaſion is known in Mexico. Montezuma was ſo well pleaſed with the victory, that he not only forgave the diſobedience of his orders, but beſtowed upon Moquihuix a princeſs, one of his own couſins, to wife.

56
Chalceſe rebel, and are deſtroyed.

The next exploit of this great warrior was the entire deſtruction of the Chalceſe, whoſe reſtleſs diſpoſition continually brought miſchief upon themſelves. They had, it ſeems, formed a deſign of making their city a rival to Mexico; and with this view had taken priſoner one of the brothers of Montezuma himſelf, whom they attempted to make their ſovereign abſolutely againſt his own inclination. The prince, finding it impoſſible to reſiſt, pretended to comply with their wiſhes; but that the act of exalting him to this dignity might be more conſpicuous, he deſired them to plant in the market-place one of the higheſt trees, and place a ſcaffold upon it, from whence every body might ſee him. This being done, the Mexicans who had been taken along with him aſſembled round the tree; and the prince having aſcended the ſcaffold with a bunch of flowers in his hand, addreſſed them to the following purpoſe: "Ye know well, my brave Mexicans, that the Chalceſe wiſh to make me their king; but it is not agreeable to our god that I ſhould betray our native country; I chooſe rather to teach you, by my example, to place higher value on fidelity to it.

Mexico.

it than on life itſelf." With theſe words he threw himſelf from the ſcaffold, and was killed. The Chalceſe were ſo enraged at this, that they inſtantly fell upon the Mexicans and killed them with their darts. Next evening they were terrified by a ſcreech owl; the diſmal voice of which animal they interpreted into an omen of their approaching ruin. They were not deceived in their predictions, which indeed they might have made without any ſcreech-owl. They were quickly attacked by Montezuma; who on this occaſion was ſo much exaſperated, that he cauſed fires to be lighted on the tops of the adjacent mountains, as ſymbols of the puniſhment to which he condemned the rebels. The havock he made among them was ſuch, that the province was almoſt depopulated. Vaſt numbers were ſlaughtered, while thoſe who eſcaped with life fled into the caves of the neighbouring mountains. Some fled into diſtant countries, leaving their city to be deſtroyed by the enemy. At laſt Montezuma, ſatiated with revenge, proclaimed a general pardon, and invited the fugitives to return; but many of them, not putting any confidence in his ſincerity, choſe to remain in their ſtate of exile. The remainder of this emperor's reign was taken up in making new conqueſts; ſo that by the time of his death, which happened in 1464, he had extended his dominions as far as the gulf of Mexico on the eaſt; to the middle of the country of the Mixtecas on the ſouth-eaſt; ſomething farther than Chilapan on the ſouth; to the valley of Toluca on the weſt; the centre of the country of the Otomies on the north-weſt; and, on the north, to the extremity of the vale of Mexico.

3
Inundation and famine at Mexico

During the reign of this great monarch a violent inundation happened in Mexico. The lake, ſwelled by the exceſſive rains which fell in the year 1446, poured its waters into the city with ſo much violence that many houſes were deſtroyed, and the ſtreets inundated to ſuch a degree that boats were every where made uſe of. To prevent accidents of this kind for the future, Montezuma, by advice of the king of Tezcuco, conſtructed a great dyke nine miles in length, eleven cubits in breadth, and conſiſting of two parallel lines of paliſades, the interval betwixt which was filled up with ſtones and ſand. The greateſt difficulty in the conſtruction lay in being obliged occaſionally to work in the lake itſelf, which in ſome places was of conſiderable depth; but this was ſurmounted by the ſkill and perſeverance of the workmen. The dyke, when conſtructed, proved of great ſervice in keeping out the waters, though it did not entirely remedy the evil; nor indeed have the Spaniards been able to ſecure this city effectually from inundations, after being in poſſeſſion of it for more than two centuries.

The inundation was ſoon followed by a famine. This was occaſioned by the ſtinting of the crop of maize in 1448; the ears while young and tender being deſtroyed by froſt. In 1450 the crop was totally loſt for want of water; and in 1451, beſides the unfavourable ſeaſons, there was a ſcarcity of ſeed. Hence, in 1452, the neceſſities of the people became ſo great, that they were obliged to ſell themſelves for ſlaves in order to procure ſubſiſtence. Montezuma permitted them to go to other countries for ſupport; but being informed that many ſold themſelves for a few days proviſion, he ordered by proclamation, that no woman ſhould ſell herſelf for leſs than 400 ears of wheat, nor any man for leſs than 500. He opened alſo the public granaries for the relief of the lower claſſes; but nothing was able to ſtop the progreſs of the famine. Many who went for relief to other countries periſhed with hunger on their journey; and great numbers who ſold themſelves for ſlaves never returned to their native country. Moſt of the populace ſupported themſelves, like their anceſtors, on the produce of the lake, until all their diſtreſſes were relieved by a moſt plentiful harveſt in the year 1454.

4
Axayacatl ſucceeds Montezuma.

Montezuma was ſucceeded by Axayacatl, who like his predeceſſor inſtantly commenced a war, for no other reaſon than that he might have priſoners to ſacrifice at his coronation. The people whom he now attacked inhabited the province of *Tecuantepec* on the coaſt of the Pacific Ocean, and ſituated at 400 miles diſtance from the city of Mexico. A very deſperate battle enſued on this occaſion, in which, however, the Mexicans at laſt prevailed; and, beſides the poor wretches doomed to deſtruction whom they carried off, acquired a conſiderable ſpoil, as well as a tract of territory extending to Coatulco, a maritime place much frequented in the next century by the Spaniards.

5
His conqueſts.

Axayacatl purſued Montezuma's plan of conqueſt; in which, however, he was leſs ſucceſsful, many of the provinces reduced by that monarch having revolted after his death, ſo that it was neceſſary to reconquer them. On his returning ſucceſsful from one of theſe expeditions, he built a new temple, to which he gave the name of *Coatlon;* but the Tlatelolcos, whoſe ancient rivalſhip ſeems to have revived on the death of Montezuma, built another in oppoſition, which they called *Coaxolotl.* Thus the former hatred between the two nations was renewed, and a diſcord took place which ended in the ruin of the Tlatelolcos.

6
Death of the kings of Acolhuacan and Tacuba.

The Mexicans ſuſtained an irreparable loſs in 1469 and 1470 by the death of their allies the kings of Tacuba and Acolhuacan; for though the league which had been concluded between the three nations continued without any violation till the arrival of the Spaniards, we cannot ſuppoſe that any of the ſucceſſors of the Tacuban and Acolhuacan princes would have the ſame cordial affection for thoſe of Mexico which was entertained by thoſe who lay under ſuch great obligations to Montezuma. The king of Tacuba was ſucceeded by his ſon Chimalpopoca, and the Acolhuan monarch by his ſon Nezahualpilli. A ſhort time after the acceſſion of the latter, the war broke out between the Tlatelolcos and Mexicans, which ended in the deſtruction of the former. King Moquihuix had been married by Montezuma to a ſiſter of Axayacatl, now on the throne of Mexico; but it appears that this princeſs never was greatly the object of his affection. On the contrary, he took all methods of expreſſing his diſlike, either out of enmity to herſelf, or envy of the ſuperior greatneſs of her brother. Not content with this, he entered into an alliance with a great number of the neighbouring ſtates, in order to reduce the Mexican greatneſs. His wife, however, being informed of this ſcheme, communicated the particulars to her brother; and ſoon after, being impatient of the ill uſage ſhe received, came to Mexico with her four ſons to claim the protection of her brother. This uncommon accident exaſperated the Mexicans and Tlatelolcans againſt each other to ſuch a degree, that wherever they met, they fought, abuſed, and murdered each other. The king of Tlatelolco prepared for war with many horrid ceremonies, of which the drinking of human blood was one. A day was appointed for attacking Mexico. Xiloman, lord of Colhuacan, was to begin the attack, afterwards to pretend flight, in order to induce the Mexicans to follow him; after which the Tlateloleos were to fall upon their rear. For ſome reaſon, however, with which we are not acquainted, the Tlateloleos began the attack without waiting for Xiloman; the conſequence of which was, that he retired in diſguſt, leaving them to finiſh their battle the beſt way they could. The engagement laſted till night, when the Tlateloleos were obliged to retire. Axayacatl, during the night, diſpoſed of his troops in all the roads which led to Tlatelolco, appointing them to meet in the market-place. The Tlatelolcos, finding themſelves attacked on all ſides, retired gradually before the Mexicans, until at laſt they were forced into the market-place, where they found themſelves worſe than ever on account of its narrowneſs, which did not allow them room to act. The king ſtood on the top of the great temple, encouraging his men to exert themſelves againſt the enemy. His words, however, had now loſt their uſual influence. He not only was not obeyed, but was reproached with cowardice becauſe he did not come down and fight among the reſt. At laſt the Mexicans arrived at the temple, and aſcended to the balcony where the king was. He made a deſperate defence for a little; but by a violent puſh in the breaſt was thrown backward upon the ſteps of the temple, and ſtunned or perhaps killed by the fall. The ſoldiers took him up and carried him to Axayacatl; who with his own hand cut open his breaſt and tore out his heart. His people then attempted to fly acroſs the market-place; but a great number of them were killed, among whom were many officers of diſtinction. The city of Tlatelolco was then united with Mexico, as a part or kind of ſuburb, which it ſtill continues to be.

The Tlatelolcos being thus reduced, Axayacatl next ſet out on an expedition againſt the Matlatzincas, a tribe in the vale of Toluca, who ſtill refuſed to ſubmit to the Mexican yoke. Having proved ſucceſsful in this expedition, he undertook to ſubdue alſo the northern part of the valley, now called *Valle d' Ixtlahuacan*, particularly *Xiquipilco*, a conſiderable city and ſtate of the Otomies, whoſe chief was much renowned for ſtrength and bravery. Axayacatl, who likewiſe valued himſelf on theſe qualities, encountered him in ſingle combat. In this, however, he was over-matched, and received a violent wound on the thigh; after which he would have been taken priſoner, had not ſome young Mexicans made a deſperate effort for his reſcue. Notwithſtanding this diſaſter, Axayacatl's army gained a complete victory, carrying off 11060 priſoners, among whom was the chief of the Otomies himſelf, and two of his officers who had attacked the king. Theſe chiefs were put to death at an entertainment of the allied kings, the ſight of their agonies not interrupting in the leaſt the mirth of the feaſt; ſo much were they familiarized to the ſhedding of human blood. Mexico.

Axayacatl continued to extend his territories to the eaſt and weſt, till his progreſs was ſtopped by death in 1477. He was ſucceeded by his elder brother Tizoc; of whoſe reign we know little, but that he conquered fourteen cities, ſome of which had been in rebellion. He intended to have built a larger temple than any that had yet been ſeen in Mexico, though that originally built had been greatly enlarged by ſome of his predeceſſors. For this purpoſe he collected a great quantity of materials; but before he could bring his projects to bear, he was taken off by a conſpiracy of his ſubjects. We are not informed in what manner he died; moſt probably it was by poiſon, as the conſpirators wiſhed his death to paſs for natural. It being diſcovered to be otherwiſe, however, diligent ſearch was made for the criminals, who were puniſhed according to their deſerts. During the reign of Tizoc, the Acolhuacans made war upon the Huexotzincas, ruined their city, and conquered their territory. Nezahualpilli alſo, the Acolhuacan monarch, though he had already ſeveral wives, had not made any of them queen, having wiſhed to confer that honour upon one of the royal family of Mexico. Tizoc readily gave him one of his grand-daughters, who had a ſiſter of ſingular beauty named *Xocotzin*. The friendſhip betwixt theſe two ladies was ſuch, that the one could not think of being ſeparated from the other; for which reaſon the new queen ſought and obtained permiſſion to take her ſiſter along with her to Tezcuco. Xocotzin had not been long there before the king fell in love with her, and married her with the title of queen likewiſe. Soon after this ſecond marriage, the firſt queen brought forth a ſon named *Cacamatzin*, who ſucceeded him in the throne, and was afterwards taken priſoner by the Spaniards.

63 Is ſucceeded by Tizoc.

Ahuitzotl, the brother of Tizoc, ſucceeded him in the kingdom of Mexico. His firſt object was to finiſh the great temple begun by his predeceſſor; and ſuch was the number of workmen, that it was completed in four years. During the time that it was building, the king employed himſelf in making war with different nations, reſerving all the priſoners he took for victims at the dedication of the temple. The number of priſoners ſacrificed at this dedication is ſaid by Torquemada to have been 72,224; by other hiſtorians 64,060. The miſerable victims were ranged in two files, each a mile and an half in length, terminating at the temple. The ſame year another temple was built by a feudatory lord, in imitation of the great one built by the king; at the dedication of which a vaſt number of priſoners were alſo ſacrificed. Theſe temples were dedicated in 1486. In 1487 happened a violent earthquake; and Chimalpopoca king of Acolhuacan died, who was ſucceeded by Totoquihuatzin II.

64 Ahuitzotl dedicates a temple with a multitude of human victims.

The remainder of the life of Ahuitzotl was a continued ſeries of wars, in all of which he proved ultimately ſucceſsful, extending the Mexican dominions as far as Guatimala, 900 miles to the ſouth-eaſt of Mexico. In only one expedition the Mexicans were defeated with diſgrace. This happened in 1495, when they ſuddenly, and as appears without any provocation, entered the vale of Atlixco in an hoſtile

65 His conqueſts.

manner.

Mexico. manner. So unexpected was the invasion, that the inhabitants of Atlixco knew only of the intention of their enemies by seeing them in arms in their country. Finding it impossible to raise in an instant a sufficient force among themselves, they applied to their neighbours, the Huexotzincas. On their arrival at the city, which it seems had already been rebuilt since its destruction by the Acolhuacans, they found a most celebrated captain, named Toltecatl, amusing himself at foot-ball. Being informed of the arrival of the Mexican army, he instantly quitted his diversion to repair to Atlixco; where, to show his contempt for the enemy, he entered the battle unarmed.—He supplied himself with armour by knocking down the first Mexican he met with his fist, and seizing his armour. He then attacked the enemy with such fury, and was so well seconded by his troops, that the Mexicans were totally defeated; and, in consideration of his signal bravery, the Huexotzincas made him the chief of their republic. He had not continued in his new office more than a year, however, when, finding himself unqualified for being legislator to such turbulent subjects as he had to deal with, he quitted his dignity and his country at once; and crossing the mountains with some other nobles, came to Tlalmanalco, where he was put to death, with all his companions, by order of Ahuizotl.

66 His death. Ahuizotl died in 1502, of a disorder produced by a contusion in his head. Of the cause of which we have the following account: In 1498, the king, thinking that the navigation of the lake of Mexico was become difficult on account of the scarcity of water, formed a project of supplying the deficiency from a fountain which supplied the Cojoacanese, and called upon the lord of the district to give orders for that purpose. This nobleman represented that the spring was not constant; that sometimes it was dry, and at others ran so abundantly that it might occasion some disaster in his court. Ahuizotl, however, supposing this to be a pretence, renewed his order, and put the nobleman to death for insisting upon his objection. He then caused a spacious aqueduct to be constructed from Cojoacan to Mexico; and the water was brought in with a great many superstitious ceremonies. That very year, however, there fell such quantities of rain, that the waters of the lake, augmented also by those of the spring, overflowed the city, so that the streets were filled with sailing vessels, and some houses were destroyed. The king happening to be one day in a lower apartment of his palace, the waters entered with such rapidity and violence that he was obliged to fly; and the door being low, he struck his head with such force against the top, that he never recovered the effects of the contusion. This inundation was followed by a famine, all the maize being rotted by the water.

67 Montezuma II. At the time of Ahuizotl's death, the Mexican empire was brought to its utmost extent. His successor, Montezuma *Xocojotzin*, or Montezuma *Junior*, was a person of great bravery, besides which he was likewise a priest, and held in great estimation on account of his gravity and the dignity of his deportment. His election was unanimous; and the nobles congratulated themselves on the happiness the country was to enjoy under him, little thinking how short the duration of their happiness or of their empire was to be.

The first care of the new monarch, as usual, was to procure victims for the barbarous sacrifices to be made at his coronation. The people of Atlixco, who had again shaken off the Mexican yoke, were the sufferers on this occasion, being once more reduced, though not without great loss on the part of the Mexicans, some of whose bravest officers perished in the war. The ceremony of coronation was performed with such pomp as had never been seen before in Mexico; but no sooner was this ceremony over than Montezuma began to discover a pride which nobody had suspected before. All his predecessors had been accustomed to confer offices upon persons of merit, and those who appeared the most able to discharge them, without any partiality as to birth or wealth. Montezuma, however, disapproved of the conduct of his predecessors, under pretence that the plebeians should be employed according to their rank; for that in all their actions the baseness of their birth and the meanness of their education appeared: and in consequence of this maxim he deprived all the commoners of the offices they held about the court, declaring them incapable of holding any for the future. All the royal servants now were people of rank. Besides those who lived in the palace, 600 feudatory lords and nobles came to pay court to him. They passed the whole day in the antichamber, where none of their servants were permitted to enter; conversing in a low voice, and waiting the orders of their sovereign.—The servants of these lords were so numerous that they occupied three small courts of the palace, and many waited in the streets. The women were not less numerous. All these last were confined in one vast seraglio, under the care of some noble duennas, who kept a strict watch over their conduct. From this collection the emperor selected such as he liked best for himself, giving away the rest; and so well did he acquit himself in his matrimonial capacity, that *an hundred and fifty* of his wives are said to have been pregnant at once.

The pride of Montezuma was no less conspicuous in the ceremonials than in the magnificence of his court. None durst enter the palace without pulling off his shoes and stockings at the gate; neither durst they appear pompously dressed in the imperial presence; this being deemed a want of respect to majesty.—All who entered the hall of audience, before speaking to the king, made three bows; at the first, saying *Lord!* at the second, *My Lord!* and at the third, *Great Lord!* They spoke low, and with the head inclined, receiving the answer which the king gave them by secretaries, with as great humility as if it had been the voice of a deity; and no person in taking leave ever turned his back on the throne. When this mighty emperor went abroad, he was carried on the shoulders of the nobility, in a litter covered with a rich canopy, and attended by a numerous retinue of courtiers; and wherever he passed, every person shut their eyes, as fearing to be dazzled with the splendor of Majesty. When he alighted from the litter to walk on foot, carpets were spread on the ground, that the emperor might not be permitted to touch the earth with his feet.

In

In every reſpect Montezuma kept up, as far as was poſſible, this extravagant appearance of dignity. His kitchen-utenſils were of the fineſt earthen ware, and his table-cloths and napkins of the fineſt cotton; but none of theſe ever ſerved the emperor more than once, being immediately made a preſent of to ſome nobleman. The veſſels in which his chocolate and other drinks from cocoa were prepared, were all of gold, or ſome beautiful ſea-ſhell, or naturally-formed veſſels, curiouſly varniſhed. He had alſo gold-plate, but it was uſed only on particular occaſions in the temple. The number and variety of his diſhes aſtoniſhed the Spaniards. Cortes ſays, that they covered the floor of a great hall; and that there were diſhes of every kind of game, fiſh, fruit, or herbs, in the country. This dinner was carried in ſtate by three or four hundred of the young nobility, who retired as ſoon as the king ſat down to table: and that the meat might not grow cold, each plate was furniſhed with a chafing diſh. The king marked with a rod the diſhes he choſe for himſelf, and the reſt were diſtributed among the nobility in the antichamber. Before he ſat down, four of the moſt beautiful women of his ſeraglio ſupplied him with water to waſh his hands, and continued ſtanding all the time of his dinner, along with ſix of his principal miniſters and his carvers.

Montezuma took great delight in the cleanlineſs of his own perſon, and of every thing about him. He bathed regularly every day, and had baths in all his palaces. Every day he wore four dreſſes, never uſing again thoſe which he had put off, but reſerving them as largeſſes for the nobility, or thoſe who had diſtinguiſhed themſelves in war.

The expence of all this, and many other inſtances of magnificence, rendered the emperor very diſagreeable to a great number of his ſubjects; though others were pleaſed with the readineſs he ſhowed to relieve the neceſſities of individuals, and his generoſity in rewarding his generals and miniſters who deſerved it. Among other actions worthy of imitation, he appointed the city of Colhuacan as an hoſpital for all invalids, who after having faithfully ſerved the crown either in the civil or military line, required a proviſion on account of their age and infirmities. In this place they were maintained and attended at the expence of the king.

The reign of Montezuma, even before the arrival of the Spaniards, was far from being ſo glorious with regard to his ſucceſſes in war as thoſe of his predeceſſors had been. He reduced indeed one rebellious province, and conquered another which had never before been ſubjugated; but in his war with Tlaſcala he was by no means ſucceſsful. This was but a ſmall republic at no great diſtance from the capital, but the inhabitants were remarkable for their bravery and independent ſpirit. The neighbouring ſtates, however, who had been reduced by the Mexicans, envious of their liberty and proſperity, exaſperated the Mexicans againſt them, by repreſenting that the Tlaſcalans were deſirous of making themſelves maſters of the maritime provinces on the Mexican gulf, and that by their commerce with theſe provinces they were encreaſing their wealth and power, and gaining the hearts of the people with whom they were to traffic. In conſequence of this repreſentation, ſtrong garriſons were placed on the frontiers of Tlaſcala, to obſtruct the commerce of the inhabitants, and thus to deprive them of the means of obtaining ſome of the neceſſaries of life. The Tlaſcalans complained; but received no other anſwer than that the king of Mexico was lord of all the world, and that the Tlaſcalans muſt ſubmit and pay tribute to him. The Tlaſcalans returned a ſpirited anſwer to this inſolent ſpeech, and began to fortify their frontier. They had already incloſed all the lands of the republic with intrenchments; and to theſe they now added a wall of ſix miles in length on the weſt ſide, where an invaſion was moſt to be apprehended; and ſo well did they defend themſelves, that though they were frequently attacked by the neighbouring ſtates in alliance with Mexico, or ſubject to it, not one of them was able to wreſt a foot of ground from them. Thus a continual ſeries of wars and engagements took place between the ſtates of Mexico and this republic, which continued till the arrival of the Spaniards. The moſt remarkable occurrences in theſe wars are the exploits of a Tlaſcalan general named Tlahuicol. His courage and ſtrength were ſo great, that his enemies fled whereever he appeared. The ſword with which he fought was ſo weighty, that no man of ordinary ſtrength could lift it from the ground. At laſt, however, having in the heat of an engagement got into a marſh, his great ſtrength was of no uſe to him, ſo that he was taken priſoner, put into a ſtrong cage, and carried to Mexico. The emperor, in conſideration of his extraordinary qualities, gave him liberty to return to his own country: but this he abſolutely refuſed, ſaying, that he wiſhed to die, like other priſoners, in honour of their god. In this he perſiſted obſtinately for ſeveral years; until at laſt Montezuma reſolved to comply with his barbarous deſire; and he was permitted to die by the gladiatorian ſacrifice, to be afterwards deſcribed, in which the priſoner was allowed, though under great diſadvantages, to fight for his life. He was oppoſed by ſeveral brave men, one at a time, of whom he killed eight, and wounded twenty more; until, falling almoſt dead by a violent blow he received on the head, he was carried to the temple and there ſacrificed.

71 Exploits and death of Tlahuicol.

72 Apprehenſion entertained by the Mexicans of the arrival of a new people.

During the remainder of Montezuma's reign the empire was diſturbed by various rebellions, of which the accounts are not ſufficiently intereſting to merit a particular detail; but in the year 1508, Montezuma began to entertain apprehenſions of that fatal event which at length overtook him. An expedition having been undertaken againſt a very diſtant region named Amatla, the army in marching over a lofty mountain were attacked by a furious north-wind, accompanied with ſnow; which made great havock in the army, many of them periſhing with cold, and others being killed by the trees rooted up by the wind. The remains of the army continued their march to Amatla, where they were almoſt all killed in battle. By this and other calamities, together with the appearance of a comet, the Mexicans were thrown into the utmoſt conſternation. Montezuma was ſo terrified by theſe omens, that having in vain conſulted his aſtrologers, he applied to the king of Acolhuacan, who was reported to be very ſkilful in divination. Nezahualpilli having conferred with him at length upon the ſubject, told Montezuma that the comet preſaged ſome calamity which was about to befal their kingdoms by the arrival

Mexico.

arrival of a new people: but this being unſatisfactory to the emperor, the king of Acolhuacan challenged him to a game at foot-ball, ſtaking the truth of his prediction on the iſſue of the game. Montezuma loſt the game, but did not yet acquieſce in the truth of his prediction. He therefore applied to a celebrated aſtrologer, whom it ſeems he had not yet conſulted; but he confirmed the interpretation of Nezahualpilli: for which the emperor cauſed his houſe to be pulled down, and himſelf buried in the ruins.

73 Story of the reſurrection of a princeſs.

Many other preſages of the arrival of the Spaniards are related. The following, though apparently the moſt incredible of them all, ſeems to be believed by Clavigero. "A ſiſter of Montezuma named Papantzin, who had been married to the governor of Tlatelolco, lived in his palace after he was dead to the year 1509, when ſhe died of old age. The day after her burial a child of five or ſix years old happened to paſs from her mother's apartment to that of the major domo of the deceaſed princeſs. In paſſing by, the child ſaw the princeſs ſitting upon the ſteps of the fountain where ſhe had been accuſtomed to bathe, and heard herſelf called by the name of *cocoton*, a Mexican expreſſion of endearment, ſignifying "little girl." The child, incapable from its age of reflecting on the death of the princeſs, approached without fear, and was deſired to call the wife of her major-domo. The woman careſſed the child, and told her that the princeſs was dead; but being importuned and pulled by the gown, ſhe at laſt went; but no ſooner ſaw the princeſs than ſhe fainted. The child then ran to call her mother, who with two other women came to the aſſiſtance of the wife of the major-domo; but they alſo would have fainted, had not the princeſs called to them, and aſſured them that ſhe was really alive. Having cauſed them call the major-domo, ſhe deſired him to go and tell Montezuma what he had ſeen: but he, dreading the ſeverity of the emperor, durſt not undertake the taſk. She then deſired him to go to Tezeuco, and tell Nezahualpilli that ſhe wiſhed to ſee him. He came accordingly, and at her deſire brought Montezuma; whom ſhe informed, that during the time ſhe lay entranced ſhe had ſeen a viſion. The main purport of this viſion was to announce to her, that all her forefathers were damned; that another race of men ſhould arrive, who ſhould conquer the kingdom, and introduce the true religion; and "as ſoon as the bath ſhould be publiſhed and made known, which would waſh away ſin, ſhe ſhould be the firſt to accept of it."

74 The expectation of the Mexicans accounted for.

There can be very little doubt that this ſtory is a fiction of the Spaniſh prieſts, though it cannot be doubted that the Mexicans had ſome expectations of the arrival of the Spaniards among them at the time they actually came. This, however, we may account for without having recourſe to any thing the leaſt ſupernatural, or out of the ordinary courſe of things. The Weſt India iſlands had been diſcovered by Columbus in 1492: he had made frequent voyages, and had even diſcovered the continent. Settlements had been made; the Spaniards had ſhown their proweſs and their cruelty; and we are not to doubt, that many of the iſlanders would quit their habitations to eſcape the fury of the invaders. It would naturally occur to theſe fugitives, that the arms of theſe new comers could not be reſiſted by thoſe of the weſtern nations, while their relentleſs cruelty might eaſily ſuggeſt that they would deſtroy all before them. From the year 1492, therefore, to 1508, there was time enough for this report to have reached Mexico: and we can only attribute it to the barbarous ſtate in which the Americans were, that the Spaniards were not perfectly known and deſcribed before their arrival.

75 Vaſt numbers of human ſacrifices.

But whatever were the omens by which the arrival of the Spaniards was announced, they appear to have had no effect in working any reformation upon Montezuma or his Mexicans. Inſtead of relaxing any thing from the barbarity of their religion, they ſeem to have augmented it. Wars were carried on every where, and priſoners ſacrificed by thouſands; inſomuch, that Montezuma finding the ſtone on which the priſoners were ſacrificed too ſmall, he cauſed one of monſtrous ſize to be put in its place. It was dragged along by an immenſe number of people: but, in paſſing a wooden bridge over a canal, in the entry to the city, the bridge broke down by its enormous weight, and dragged ſeveral people into the water, among whom was the high-prieſt, who had accompanied it on the road, ſcattering incenſe as he went along. This misfortune diſconcerted them conſiderably: nevertheleſs the ſtone, by dint of exceſſive labour, was got up again, and conſecrated by the murder of 12,200 priſoners. The time, however, was now at hand when this horrible and never-ceaſing butchery was to be ended, and a moſt ſevere vengeance to overtake the perpetrators. The Spaniards having eſtabliſhed themſelves pretty well in the iſland of Cuba and Hiſpaniola, now prepared to explore the continent alſo, with a view to extend the dominions of their ſovereign, and to ſatiate, if poſſible, their own appetites for wealth.

76 Conqueſt of Mexico undertaken by Cortes.

Mexico itſelf was firſt diſcovered, though imperfectly, by a Spaniard named *Nunez de Balboa*; but in 1518 the conqueſt of it was undertaken by a celebrated adventurer named *Ferdinando Cortes*. It was not, however, without great difficulty that he got his expedition ſet on foot; being perſecuted by the Spaniſh governors in the Weſt Indies, ſo that he was at laſt obliged to throw off his allegiance to them, and proceed without any commiſſion. However, on the 10th of February 1519, he ſet ſail from the Havannah in Cuba; and ſoon landed on the iſland of Cozumel, on the coaſt of Yucatan, diſcovered the preceding year. Here he joined one of his officers named *Pedro d'Alvaredo*, who had arrived ſome days before, and collected ſome booty and taken a few priſoners. But the general ſeverely cenſured his conduct; and the priſoners were diſmiſſed, after they had been informed by an Indian interpreter named *Melchior*, that ſuch injuries were entirely diſagreeable to the intentions and wiſhes of Cortes. Here he muſtered his army, and found that it amounted to 508 ſoldiers, 16 horſemen, and 109 mechanics, pilots, and mariners. Having encouraged his men by a proper ſpeech, and releaſed, by means of ſome Indian ambaſſadors, a Spaniard named *Jerom de Aguilar*, who had been detained a priſoner for eight years, he proceeded to the river Tabaſco, where he hoped to be received in a friendly manner, as one Grijalva had been a ſhort time before; but, from ſome unknown cauſe, he was violently attacked by them: however, the ſuperiority of the Spaniſh arms ſoon decided the victory, and the inhabitants were

were obliged to own the king of Caſtile as their ſovereign.

The Spaniards then continued their courſe weſtward, to the harbour of St Juan de Ulloa; where they were met by two Mexican canoes, who carried two ambaſſadors from the emperor of that country, and ſhowed the greateſt ſigns of peace and amity. Their language was unknown to Aguilar; but one of the female priſoners above-mentioned underſtood it, and tranſlated it into the Yucatan tongue; after which Aguilar interpreted the meaning in Spaniſh. This ſlave was afterwards named *Donna Marina*, and proved very uſeful in their conferences with the natives.

At this time the Mexican empire, according to Dr Robertſon, was arrived at a pitch of grandeur to which no ſociety had ever attained in ſo ſhort a period. Though it had ſubſiſted only for 130 years, its dominion extended from the north to the ſouth ſea; over territories ſtretching about 500 leagues from eaſt to weſt, and more than 200 from north to ſouth; comprehending provinces not inferior in fertility, population, and opulence, to any in the torrid zone.—Though by nature Montezuma poſſeſſed a good deal of courage and reſolution; yet from the firſt moment that the Spaniards appeared on his coaſt, he diſcovered ſymptoms of timidity and embarraſſment, and all his ſubjects were embarraſſed as well as himſelf. The general diſmay which took place on this occaſion was partly owing to the ſtrange figure the Spaniards made, and the prodigious power of their arms; but partly alſo to the following circumſtance: An opinion prevailed almoſt univerſally among the Americans, that ſome dreadful calamity impended over their heads, from a race of formidable invaders who ſhould come from regions towards the riſing ſun, to over-run and deſolate their country. The origin of this we have already attempted to explain; but as the Mexicans were more prone to ſuperſtition than any people in the new world, they were more deeply affected with the appearance of the Spaniards, whom they inſtantly ſuppoſed to be the inſtruments deſtined to bring about that fatal revolution which they dreaded: and this produced the embaſſy above-mentioned.

By means of his two interpreters, Donna Marina and Aguilar, Cortes learned that the chiefs of the Mexican embaſſy were deputies from Pilpatoe and Teutile; the one governor of a province under the emperor, and the other the commander of all his forces in that province: the purport of their embaſſy was, to inquire what his intentions were in viſiting their coaſts, and to offer him what aſſiſtance he might need in order to continue his voyage. Cortes, in his turn, alſo profeſſed the greateſt friendſhip; and informed the ambaſſadors, that he came to propoſe matters of the utmoſt conſequence to the welfare of the prince and his kingdom; which he would more fully unfold in perſon to the governor and the general. Next morning, without waiting for any anſwer, he landed his troops, his horſes, and his artillery; began to erect huts for his men, and to fortify his camp.—The natives, inſtead of oppoſing the entrance of theſe fatal gueſts into their country, aſſiſted them in all their operations with an alacrity which they had ere long reaſon to repent.

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The next day the ambaſſadors had a formal audience; at which Cortes acquainted them, that he came from Don Carlos of Auſtria, king of Caſtile, the greateſt monarch of the eaſt, and was intruſted with propoſitions of ſuch moment, that he would impart them to none but the emperor himſelf, and therefore required to be conducted immediately to the capital. This demand produced the greateſt uneaſineſs; and the ambaſſadors did all in their power to diſſuade Cortes from his deſign, endeavouring to conciliate his good-will by the preſents ſent him by Montezuma. Theſe they introduced with great parade, and conſiſted of fine cotton-cloth, of plumes of various colours, and of ornaments of gold and ſilver to a conſiderable value, the workmanſhip of which appeared to be as curious as the materials were rich. But theſe preſents ſerved only to excite the avidity of the Spaniards, and to increaſe their deſire for becoming maſters of a country which abounded with ſo many precious commodities. Cortes indeed could ſcarcely reſtrain himſelf ſo far as to hear the arguments made uſe of by the ambaſſadors to diſſuade him from going to the capital; and, in a haughty, determined tone, inſiſted on his former demand of being admitted to a perſonal interview with their ſovereign.

80 The Indians endeavour to diſſuade him from going to the capital, but in vain.

During this converſation, ſome painters in the retinue of the Mexican chiefs had been diligently employed in delineating, upon white cotton cloths, figures of the ſhips, horſes, artillery, ſoldiers, and whatever elſe attracted their eyes as ſingular. When Cortes obſerved this, and was informed that theſe pictures were to be ſent to Montezuma, he reſolved to render the repreſentation ſtill more ſtriking and intereſting. The trumpets, by his orders, ſounded an alarm; the troops formed in order of battle, and ſhowed their agility and ſtrength in the beſt manner they could; while the artillery was pointed againſt the neighbouring trees, among which it made dreadful havock. The Indians for ſome time looked on with ſilent aſtoniſhment; but at the exploſion of the cannon, ſome fled, others fell to the ground, and all were ſo confounded, that Cortes found it difficult to quiet and compoſe their minds.

81 Montezuma made acquainted with his deſign.

When the painters had exerted their utmoſt efforts in repreſenting all theſe wonderful things, meſſengers were immediately diſpatched to Montezuma with the pictures, and a full account of every thing that had paſſed ſince the arrival of the Spaniards, together with ſome European curioſities to Montezuma; which, though of no great value, Cortes believed would be acceptable on account of their novelty. The Mexican monarchs, in order to obtain the earlieſt information of every occurrence in all parts of their empire, had couriers poſted at proper ſtations along the principal roads; and as theſe were trained to agility by a regular education, they conveyed intelligence with ſurpriſing rapidity. Though the city in which Montezuma reſided was above 180 miles from St Juan de Ulloa, Cortes's preſents were carried thither, and an anſwer returned to his demands, in a few days. As the anſwer was unfavourable, Montezuma had endeavoured to mollify the Spaniſh general by the richneſs of his preſents. Theſe conſiſted of the manufactures of the country; cotton-ſtuffs ſo fine, and of ſuch delicate

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82 Sends an unfavourable answer, but accompanied with rich presents.

delicate texture, as to resemble silk; pictures of animals, trees, and other natural objects, formed with feathers of different colours, disposed and mingled with such skill and elegance as to rival the works of the pencil in truth and beauty of imitation. But what chiefly attracted their attention, were two large plates of a circular form; one of massive gold representing the sun, the other of silver representing the moon. These were accompanied with bracelets, collars, rings, and other trinkets of gold; and that nothing might be wanting which could give the Spaniards a complete idea of what the country afforded, some boxes filled with pearls, precious stones, and grains of gold unwrought, as they had been found in the mines or rivers, were sent along with the rest. Cortes received all with an appearance of the most profound respect for Montezuma; but when the Mexicans, presuming upon this, informed him, that their master, though he desired him to accept of what he had sent as a token of his regard for the prince whom he represented, would not give his consent that foreign troops should approach nearer to his capital, or even allow them to continue longer in his dominions, Cortes declared, in a manner more resolute and peremptory than formerly, that he must insist on his first demand; as he could not, without dishonour, return to his own sovereign until he was admitted into the presence of the prince whom he was appointed to visit in his name. The Mexicans were astonished at the sight of a man who dared to oppose the will of their emperor; but not being willing to come to an open rupture with such formidable enemies, with much ado they prevailed upon Cortes to promise that he would not move from his present camp until the return of a messenger whom they sent to Montezuma for further instructions.

83 Cortes still insists on his demands.

The pusillanimity of the Indian monarch afforded time to the Spaniards to take measures which would have been out of their power had they been vigorously attacked on their first refusal to obey his orders. Cortes used every method of securing the affections of the soldiers; which indeed was very necessary, as many of them began to exclaim against the rashness of his attempt in leading them against the whole force of the Mexican empire. In a short time Teutile arrived with another present from Montezuma, and together with it delivered the ultimate orders of that monarch to depart instantly out of his dominions; and when Cortes, instead of complying with his demands, renewed his request of audience, the Mexican immediately left the camp with strong marks of surprise and resentment. Next morning, none of the natives appeared; all friendly correspondence seemed to be at an end, and hostilities were expected to commence every moment. A sudden consternation ensued among the Spaniards, and a party was formed against him by the adherents of Velasques; who took advantage of the occasion, and deputed one of their number, a principal officer, to remonstrate, as if in name of the whole army, against his rashness, and to urge the necessity of his returning to Cuba. Cortes received the message without any appearance of emotion; and as he well knew the temper and wishes of his soldiery, and foresaw how they would receive a proposition so fatal to all the splendid hopes and schemes which they had been forming

84 Montezuma peremptorily commands him to leave his dominions.

with such complacency, he pretended to comply with the request now made him, and issued orders that the army should be in readiness next day to embark for Cuba. Upon hearing this, the troops, as Cortes had expected, were quite outrageous: they positively refused to comply with these orders, and threatened immediately to choose another general if Cortes continued to insist on their departure.

Our adventurer was highly pleased with the disposition which now appeared among his troops: nevertheless, dissembling his sentiments, he declared, that his orders for embarking had proceeded from a persuasion that it was agreeable to his fellow-soldiers, to whose opinion he had sacrificed his own; but now he acknowledged his error, and was ready to resume his original plan of operation. This speech was highly applauded; and Cortes, without allowing his men time to cool, set about carrying his designs into execution. In order to give a beginning to a colony, he assembled the principal persons in his army, and by their suffrages elected a council and magistrates, in whom the government was to be vested. The persons chosen were most firmly attached to Cortes; and the new settlement had the name of *Villa Rica de la Vera Cruz*; that is, the rich town of the true cross.

Villa ca[...] foun[...]

Before this court of his own making, Cortes did not hesitate at resigning all his authority, and was immediately re-elected chief-justice of the colony, and captain-general of his army, with an ample commission, in the king's name, to continue in force till the royal pleasure should be farther known. The soldiers eagerly ratified their choice by loud acclamations; and Cortes, now considering himself as no longer accountable to any subject, began to assume a much greater degree of dignity, and to exercise more extensive powers than he had done before. Some of the soldiers began to exclaim against the proceedings of the council as illegal; but the ringleaders were instantly sent on board the fleet loaded with irons. By this timely severity the rest were overawed; and Cortes, knowing of how great importance unanimity was to his future success, soon found means to reconcile those who were most disaffected; to which purpose a liberal distribution of the Mexican gold, both among friends and foes, contributed not a little.

The [...]vernm[...] of the [...] colon[...] ted i[...] Corte[...]

Cortes having thus strengthened himself as well as he could, resolved to advance into the country; and to this he was encouraged by the behaviour of the cacique or petty prince of Zempoalla, a considerable town at no great distance. This prince, though subject to Montezuma, was exceedingly impatient of the yoke; and so filled with dread and hatred of the emperor, that nothing could be more acceptable to him than an appearance of being delivered from that subjection; and a deliverance of this kind he now hoped from the Spaniards. For this reason, he sent ambassadors to Cortes, with offers of friendship, which were gladly accepted by him; and in consequence of the alliance, he very soon visited Zempoalla. Here he was received in the most friendly manner imaginable, and had a respect paid towards him almost equivalent to adoration. The cacique informed him of many particulars relating to the character of Montezuma.—He told him that he was a tyrant, haughty, cruel, and

Make [...] allian[...] with [...] caciqu[...] Zemp[...]

Chara[...] of Mo[...]zuma [...] by the [...]cique.

and ſuſpicious; who treated his own ſubjects with arrogance, ruined the conquered provinces by his extortions, and often tore their ſons and daughters from them by violence; the former to be offered as victims to his gods, the latter to be reſerved as concubines for himſelf and favourites. Cortes, in reply, artfully inſinuated, that one great object of the Spaniards in viſiting a country ſo remote from their own was, to redreſs grievances, and to relieve the oppreſſed; and having encouraged him to hope for this interpoſition in due time, continued his march to Quiabiſlan, the territory of another cacique, and where, by the friendly aid of the Indians, a Spaniſh colony was ſoon formed.

During the reſidence of Cortes in theſe parts, he ſo far wrought on the minds of the caciques of Zempoalla and Quiabiſlan, that they ventured to inſult the Mexican power, at the very name of which they had been formerly accuſtomed to tremble. Some of Montezuma's officers having appeared to levy the uſual tribute, and to demand a certain number of human victims, as an expiation of their guilt in preſuming to hold intercourſe with thoſe ſtrangers whom the emperor had commanded to leave his dominions; inſtead of obeying his orders, they made them priſoners, treated them with great indignity, and, as their ſuperſtition was no leſs barbarous than Montezuma's, they threatened to ſacrifice them to their gods. From this laſt danger, however, they were delivered by the interpoſition of Cortes, who manifeſted the utmoſt horror at the mention of ſuch a deed. This act of rebellion firmly attached the two caciques to the intereſt of Cortes; and without heſitation they acknowledged themſelves vaſſals of the king of Spain. Their example was followed by the Totonaques, a fierce people who inhabited the mountainous parts of the country. They willingly ſubjected themſelves to the crown of Caſtile; and offered to accompany Cortes with all their forces in his march towards Mexico.

Though Cortes had now taken ſuch meaſures as in a manner enſured his ſucceſs; yet as he had thrown off all dependence on the governor of Cuba, who was his lawful ſuperior, and apprehended his intereſt at court, he thought proper, before he ſet out on his intended expedition, to take the moſt effectual meaſures againſt the impending danger. With this view, he perſuaded the magiſtrates of his colony to addreſs a letter to the king, containing a pompous account of their own ſervices, of the country they had diſcovered, &c. and of the motives which had induced them to throw off their allegiance to the governor of Cuba, and to ſettle a colony dependent on the crown alone, in which the ſupreme power civil as well as military had been veſted in Cortes; humbly requeſting their ſovereign to ratify what had been done by his royal authority. Cortes himſelf wrote in a ſimilar ſtrain; but as he knew that the Spaniſh court, accuſtomed to the repeated exaggerations of American adventurers, would give little credit to the ſplendid accounts of New-Spain, if they were not accompanied with ſuch a ſpecimen of what it contained as would excite an high idea of its opulence, he ſolicited his ſoldiers to relinquiſh what they might claim as their part of the treaſures which had hitherto been collected, in order that the whole might be ſent to the king. Portocarrero and Montejo, the chief magiſtrates of the colony, were appointed to carry this preſent to Caſtile, with expreſs orders not to touch at Cuba in their paſſage thither. But while a veſſel was preparing for their departure, an unexpected event produced a general alarm. Some ſoldiers and ſailors, ſecretly diſaffected to Cortes, formed a deſign of ſeizing one of the brigantines, and making their eſcape to Cuba, in order to give ſuch intelligence to the governor as might enable him to intercept the veſſel which was to carry the treaſure and diſpatches to Spain. This conſpiracy was conducted with profound ſecrecy; but at the moment when every thing was ready for execution, the ſecret was diſcovered by one of the aſſociates. The latent ſpirit of diſaffection which Cortes was now too well convinced had not been extinguiſhed amongſt his troops, gave him very great uneaſineſs. The only method which he could think of to prevent ſuch conſpiracies for the future was, to deſtroy his fleet; and thus deprive his ſoldiers of every reſource except that of conqueſt: and with this propoſal he perſuaded his men to comply. With univerſal conſent therefore the ſhips were drawn aſhore, and, after being ſtripped of their ſails, rigging, iron-work, and whatever elſe might be of uſe, they were broke in pieces.

91 Cortes burns his fleet.

Cortes having thus rendered it neceſſary for his troops to follow wherever he choſe to lead, began his march to Zempoalla with 500 infantry, 15 horſe, and ſix field-pieces. The reſt of his troops, conſiſting chiefly of ſuch as from age or infirmity were leſs fit for active ſervice, he left as a garriſon in Villa Rica, under the command of Eſcalante, an officer of merit, and warmly attached to his intereſt. The cacique of Zempoalla ſupplied him with proviſions; and with 200 of thoſe Indians called *Tamames*, whoſe office, in a country where tame animals were unknown, was to carry burdens, and perform all manner of ſervile labour. He offered likewiſe a conſiderable body of troops; but Cortes was ſatisfied with 400; taking care, however, to chooſe perſons of ſuch note, that they might ſerve as hoſtages for the fidelity of their maſter.

Nothing memorable happened till the Spaniards arrived on the confines of the republic of Tlaſcala. The inhabitants of that province were warlike, fierce, and revengeful, and had made conſiderable progeſs in agriculture and ſome other arts. They were implacable enemies to Montezuma; and therefore Cortes hoped that it would be an eaſy matter for him to procure their friendſhip. With this view, four Zempoallans of high rank were ſent ambaſſadors to Tlaſcala, dreſſed with all the badges of that office uſual among the Indians. The ſenate were divided in their opinions with regard to the propoſals of Cortes: but at laſt Magiſcatzin, one of the oldeſt ſenators, and a perſon of great authority, mentioned the tradition of their anceſtors, and the revelations of their prieſts; that a race of invincible men, of divine origin, who had power over the elements, ſhould come from the eaſt to ſubdue their country. He compared the reſemblance which the ſtrangers bore to the perſons figured in the tradition of Mexico, their dominion over the elements of fire, air, and water; he reminded the

92 Sends ambaſſadors to the republic of Tlaſcala.

the ſenate of their prodigies, omens, and ſignals, which had lately terrified the Mexicans, and indicated ſome very important event; and then declared his opinion, that it would be raſhneſs to oppoſe a force apparently aſſiſted by heaven, and men who had already proved, to the ſad experience of thoſe who oppoſed them, that they were invincible. This orator was oppoſed by Xicotencal, who endeavoured to prove that the Spaniards were at beſt but powerful magicians: that they had rendered themſelves obnoxious to the gods by pulling down their images and altars, (which indeed Cortes had very imprudently done at Zempoalla); and of conſequence, that they might eaſily be overcome, as the gods would not fail to reſent ſuch an outrage. He therefore voted for war, and adviſed the cruſhing of theſe invaders at one blow.

93 The Tlaſcalans reſolve on war.

The advice of Xicotencal prevailed; and in conſequence of it, the ambaſſadors were detained; which giving Cortes the alarm, he drew nearer the city of Tlaſcala. In this tranſaction we may eaſily ſee how little the Tlaſcalans, notwithſtanding all their ferocity, were ſkilled in military affairs. They ſuffered Cortes, with his army drawn up in good order, to paſs a ſtrong wall between two mountains, which might have been very advantageouſly defended againſt him. He had not advanced far beyond this paſs, however, before a party of Tlaſcalans with plumes were diſcovered, which denoted that an army was in the field. Theſe he drove before him by a detachment of ſix horſe, obliged them to join another party, and then reinforcing the advanced detachment, charged the enemy with ſuch vigour that they began to retire. Five thouſand Tlaſcalans, whom Xicotencal had placed in ambuſh, then ruſhed out of their hiding places, juſt as the infantry came up to aſſiſt their ſlender body of cavalry. The enemy attacked with the utmoſt fury; but were ſo much diſconcerted by the firſt diſcharge of the fire-arms, that they retreated in confuſion, furniſhing the Spaniards with an opportunity of purſuing them with great ſlaughter. Cortes, however, ſuppoſing that this could not be their whole force, advanced with the utmoſt caution, in order of battle, to an eminence, from whence he had a view of the main body of the Tlaſcalan army commanded by Xicotencal, conſiſting of no fewer than 40,000 men. By theſe the ſmall army of Cortes was entirely ſurrounded; which Xicotencal no ſooner perceived, than he contracted the circle with incredible diligence, while the Spaniards were almoſt overwhelmed with ſhowers of arrows, darts, and ſtones. It is impoſſible but in this caſe many of the Spaniards muſt have periſhed, had it not been for the inſufficiency of the Indian weapons. Their arrows and ſpears were headed only with flint, or the bones of fiſhes; their ſtakes hardened in the fire, and wooden ſwords, though deſtructive weapons among naked Indians, were eaſily turned aſide by the Spaniſh bucklers, and could hardly penetrate the quilted jackets which the ſoldiers wore. Theſe circumſtances gave the Spaniards a prodigious advantage over them; and therefore the Tlaſcalans, notwithſtanding their valour and ſuperiority in number, could accompliſh no more in the preſent inſtance, than to kill one horſe and ſlightly wound nine ſoldiers.

The Tlaſcalans being taught by this, and ſome ſubſequent encounters, how much they were inferior to the Spaniards, began to conceive them to be really what Magiſcatzin had ſaid: a ſuperior order of beings, againſt whom human power could not prevail. In this extremity they had recourſe to their prieſts, requiring them to reveal the cauſes of ſuch extraordinary events, and to declare what means they ſhould take to repel ſuch formidable invaders. The prieſts, after many ſacrifices and incantations, delivered their reſponſe, That theſe ſtrangers were the offspring of the ſun, procreated by his animating energy in the regions of the eaſt: that, by day, while cheriſhed with the influence of his parental beams, they were invincible; but by night, when his reviving heat was withdrawn, their vigour declined and faded like herbs in the field, and they dwindled down into mortal men. In conſequence of this, the Tlaſcalans acted in contradiction to one of their moſt eſtabliſhed maxims in war, and ventured to attack the enemy in the night-time, hoping to deſtroy them when enfeebled and ſurpriſed. But the Spaniſh centinels having obſerved ſome extraordinary movements among the Tlaſcalans, gave the alarm. Immediately the troops were under arms, and ſallying out, defeated their antagoniſts with great ſlaughter, without allowing them to approach the camp. By this diſaſter the Tlaſcalans were heartily diſpoſed to peace; but they were at a loſs to form an adequate idea of the enemies they had to deal with. They could not aſcertain the nature of theſe ſurpriſing beings, or whether they were really of a benevolent or malignant diſpoſition. There were circumſtances in their behaviour which ſeemed to favour each opinion. On the one hand, as the Spaniards conſtantly diſmiſſed the priſoners whom they took, not only without injury, but often with preſents of European toys, and renewed their offers of peace after every victory; this lenity amazed people accuſtomed to the exterminating ſyſtem of war known in America, and who ſacrificed and devoured without mercy all the captives taken in battle; and diſpoſed them to entertain ſentiments favourable to their humanity. But, on the other hand, as Cortes had ſeized 50 of their countrymen who brought proviſions to their camp, and cut off their heads; this bloody ſpectacle, added to the terror occaſioned by the fire-arms and horſes, filled them with dreadful ideas of their ferocity. Accordingly they addreſſed them in the following manner: "If (ſaid they) you are divinities of a cruel and ſavage nature, we preſent to you five ſlaves, that you may drink their blood and eat their fleſh. If you are mild deities, accept an offering of incenſe and variegated plumes. If you are men, here is meat, bread, and fruit, to nouriſh you." After this addreſs, the peace was ſoon concluded, to the great ſatisfaction of both parties. The Tlaſcalans yielded themſelves as vaſſals to the crown of Caſtile, and engaged to aſſiſt Cortes in all his operations; while he took the republic under his protection, and promiſed to defend their perſons and poſſeſſions from injury and violence.

94 But are defeated and ſue for peace.

95 Which is granted.

96 Great diſtreſſes of the Spaniards.

This reconciliation took place at a very ſeaſonable juncture for the Spaniards. They were not only worn out with inceſſant toil, but ſo deſtitute of neceſſaries, that they had no other ſalve to dreſs their wounds but what

what was compoſed of the fat of Indians whom they had ſlain. Their diſtreſſes, in ſhort, were ariſen to ſuch an height, that they had begun to murmur, and even to deſpair, inſomuch that Cortes had much difficulty in reſtraining them within any kind of bounds; but the ſubmiſſion of the Tlaſcalans, and their own triumphant entry into the city, where they were received with the reverence due to a ſuperior order of beings, baniſhed at once all memory of paſt ſufferings, diſpelled every anxious thought, and fully convinced them that they could not be reſiſted by any power in America.

Cortes left no method untried to gain the favour and confidence of the Tlaſcalans; which, however, he had almoſt entirely loſt, by his untimely zeal in deſtroying their idols as he had done thoſe of Zempoalla. But he was deterred from this raſh action by his chaplain, father Bartholomew de Olmedo; and left the Tlaſcalans in the undiſturbed exercife of their ſuperſtition, requiring only that they ſhould deſiſt from their horrid practice of offering human victims. As ſoon as his troops were fit for ſervice, he reſolved to continue his march towards Mexico, notwithſtanding the remonſtrances of the Tlaſcalans, who looked upon his deſtruction as unavoidable if he put himſelf into the power of ſuch a faithleſs prince as Montezuma. But the emperor, probably intimidated with the fame of his exploits, had reſolved to admit his viſit; and informed Cortes that he had given orders for his friendly reception at Cholula, the next place of any conſequence on the road to Mexico. In this, however, he was by no means ſincere. Cholula was looked upon by all the inhabitants of the empire as a very holy place; the ſanctuary and chief ſeat of their gods, to which pilgrims reſorted from every province, and a greater number of human victims were offered in its principal temple than even in that of Mexico. Montezuma therefore invited the Spaniards thither, either from ſome ſuperſtitious hope that the gods would not ſuffer this ſacred manſion to be defiled; or from a belief, that he himſelf might there find an opportunity of cutting them off with more certainty of ſucceſs, when under the immediate protection of his gods. Cortes, however, was received with much ſeeming cordiality; but 6000 Tlaſcalan troops who accompanied him were obliged to remain without the town, as the Cholulans refuſed to admit their ancient enemies within their precincts. Yet two of theſe, by diſguiſing themſelves, got into the city, and acquainted Cortes that they obſerved the women and children belonging to the principal citizens retiring every night in a great hurry, and that ſix children had been ſacrificed in the great temple; a ſign that ſome warlike enterpriſe was at hand. At the ſame time Donna Marina, the interpreter, received information from an Indian woman of diſtinction, whoſe confidence ſhe had gained, that the deſtruction of the Spaniards was concerted; that a body of Mexican troops lay concealed near the town; that ſome of the ſtreets were barricaded, in others deep pits or trenches were dug, and ſlightly covered over, as traps into which the horſe might fall; that ſtones and miſſive weapons were collected on the tops of the temples, with which to overwhelm the infantry; that the fatal hour was already at hand, and their ruin unavoidable. Cortes, alarmed at this news, ſecretly arreſted three of the chief prieſts, from whom he extorted a confeſſion that confirmed the intelligence he had already received. As not a moment was to be loſt, he inſtantly reſolved to prevent his enemies, and to inflict on them ſuch dreadful vengeance as might ſtrike Montezuma and his ſubjects with terror. For this purpoſe the Spaniards and Zempoallans were drawn up in a large court, which had been allotted for their quarters, near the centre of the town; the Tlaſcalans had orders to advance; the magiſtrates and chief citizens were ſent for under various pretexts, and ſeized. On a ſignal given, the troops ruſhed out, and fell upon the multitude, deſtitute of leaders, and ſo much aſtoniſhed, that the weapons dropped from their hands, and they ſtood motionleſs, and incapable of defence. While the Spaniards attacked them in front, the Tlaſcalans did the ſame in the rear; the ſtreets were filled with ſlaughter; the temples, which afforded a retreat to the prieſts and ſome leading men, were ſet on fire, and they periſhed in the flames. This ſcene of horror continued two days, during which the wretched inhabitants ſuffered all that the deſtructive rage of the Spaniards, or the implacable revenge of their Indian allies, could inflict. At length the carnage ceaſed, after the ſlaughter of 6000 Cholulans, without the loſs of a ſingle Spaniard. Cortes then releaſed the magiſtrates; and reproaching them bitterly for their intended treachery, declared, that as juſtice was now appeaſed, he forgave the offence; but required them to recal the inhabitants who had fled, and re-eſtabliſh order in the town. Such was the aſcendant that the Spaniards had now obtained over this ſuperſtitious race, that this order was inſtantly complied with; and the city was in a few days again filled with people, who paid the moſt reſpectful ſervice to thoſe men whoſe hands were ſtained with the blood of their relations and fellow-citizens.

Mexico. 99 Severe puniſhment of the Cholulans.

From Cholula, Cortes advanced directly towards Mexico; and throughout the whole of his journey was entertained with accounts of the oppreſſions and cruelty of Montezuma. This gave him the greateſt hope of accompliſhing his deſign; as he now perceived that the empire was entirely divided, and no ſort of unanimity prevailed among them. No enemy appeared to check his progreſs. Montezuma was quite irreſolute; and Cortes was almoſt at the gates of the capital before the emperor had determined whether to receive him as a friend or oppoſe him as an enemy. But as no ſign of open hoſtility appeared, the Spaniards, without regarding the fluctuations of Montezuma's ſentiments, continued their march to Mexico, with great circumſpection and the ſtricteſt diſcipline, though without ſeeming to ſuſpect the prince whom they were about to viſit.

100 Diſaffection of Montezuma's ſubjects.

When they drew near the city, about 1000 perſons, who appeared to be of diſtinction, came forth to meet them, adorned with plumes, and clad in mantles of fine cotton. Each of theſe, in his order, paſſed by Cortes, and ſaluted him according to the mode deemed moſt reſpectful and ſubmiſſive in their country. They announced the approach of Montezuma himſelf, and ſoon after his harbingers came in ſight. There appeared firſt 200 perſons in an uniform dreſs, with large plumes of feathers, alike in faſhion, marching two and two, in deep ſilence, barefooted, with their eyes fixed on the ground. Theſe were followed by a company of higher

101 Meeting of Cortes and Montezuma.

rank,

Mexico. rank, in their moſt ſhowy apparel; in the midſt of whom was Montezuma, in a chair or litter richly ornamented with gold, and feathers of various colours. Four of his principal favourites carried him on their ſhoulders, others ſupported a canopy of curious workmanſhip over his head. Before him marched three officers with rods of gold in their hands, which they lifted up on high at certain intervals; and at that ſignal all the people bowed their heads, and hid their faces, as unworthy to look on ſo great a monarch. When he drew near, Cortes diſmounted, advancing towards him with officious haſte, and in a reſpectful poſture. At the ſame time Montezuma alighted from his chair, and leaning on the arms of two of his near relations, approached with a ſlow and ſtately pace, his attendants covering the ſtreet with cotton cloths, that he might not touch the ground. Cortes accoſted him with profound reverence, after the European faſhion. He returned the ſalutation, according to the mode of his country, by touching the earth with his hand, and then kiſſing it. This ceremony, the cuſtomary expreſſion of reverence from inferiors towards thoſe who are above them in rank, appeared ſuch amazing condeſcenſion in a proud monarch, who ſcarcely deigned to conſider the reſt of mankind as of the ſame ſpecies with himſelf, that all his ſubjects firmly believed thoſe perſons, before whom he humbled himſelf in this manner, to be ſomething more than human. Accordingly, as they marched through the crowd, the Spaniards frequently, and with much ſatisfaction, heard themſelves denominated *teules*, or *divinities*. Nothing material paſſed in this firſt interview. Montezuma conducted Cortes to the quarters which he had prepared for his reception; and immediately took leave of him, with a politeneſs not unworthy of a court more refined. "You are now (ſays he), with your brothers, in your own houſe; refreſh yourſelves after your fatigue, and be happy until I return." The place allotted to the Spaniards for their lodging was a houſe built by the father of Montezuma. It was ſurrounded by a ſtone-wall, with towers at proper diſtances, which ſerved for defence as well as for ornament; and its apartments and courts were ſo large as to accommodate both the Spaniards and their Indian allies. The firſt care of Cortes was to take precautions for his ſecurity, by planting the artillery ſo as to command the different avenues which led to it, by appointing a large diviſion of his troops to be always on guard, and by poſting centinels at proper ſtations, with injunctions to obſerve the ſame vigilant diſcipline as if they were within ſight of an enemy's camp.

In the evening Montezuma returned to viſit his gueſts with the ſame pomp as in their firſt interview; and brought preſents of ſuch value, not only to Cortes and to his officers, but even to the private men, as proved the liberality of the monarch to be ſuitable to the opulence of his kingdom. A long conference enſued, in which Cortes learned what was the opinion of Montezuma with reſpect to the Spaniards It was an eſtabliſhed tradition, he told him, among the Mexicans, that their anceſtors came originally from a remote region, and conquered the provinces now ſubject to his dominion; that after they were ſettled there, the great captain who conducted this colony returned to his own country, promiſing, that at ſome future period his deſcendants ſhould viſit them, aſſume the government, and reform their conſtitutions and laws; that, from what he had heard and ſeen of Cortes and his followers, he was convinced that they were the very perſons whoſe appearance and prophecies taught them to expect; that accordingly he had received them, not as ſtrangers, but as relations of the ſame blood and parentage, and deſired that they might conſider themſelves as maſters in his dominions; for both himſelf and his ſubjects ſhould be ready to comply with their will, and even to prevent their wiſhes. Cortes made a reply in his uſual ſtyle with reſpect to the dignity and power of his ſovereign, and his intention in ſending him into that country; artfully endeavouring ſo to frame his diſcourſe, that it might coincide as much as poſſible with the idea which Montezuma had formed concerning the origin of the Spaniards. Next morning, Cortes and ſome of his principal attendants were admitted to a public audience of the emperor. The three ſubſequent days were employed in viewing the city; the appearance of which, ſo far ſuperior in the order of its buildings and the number of its inhabitants to any place the Spaniards had beheld in America, and yet ſo little reſembling the ſtructure of an European city, filled them with ſurpriſe and admiration.

Deſcription of the city of Mexico. Mexico, *Tenuchtitlan*, as it was anciently called by the natives, is ſituated in a large plain, environed by mountains of ſuch height, that though within the torrid zone, the temperature of its climate is mild and healthful. All the moiſture which deſcends from the high grounds is collected in ſeveral lakes, the two largeſt of which, of about 90 miles in circuit, communicate with each other. The waters of the one are freſh, thoſe of the others brackiſh. On the banks of the latter, and on ſome ſmall iſlands adjoining to them, the capital of Montezuma's empire was built. The acceſs to the city was by artificial cauſeways or ſtreets, formed of ſtones and earth, about 30 feet in breadth. As the waters of the lake, during the rainy ſeaſon, overflowed the flat country, theſe cauſeways were of conſiderable length. That of Tacuba on the weſt a mile and a half; that of Tezenco on the north-weſt three miles; that of Cuoyacan towards the ſouth ſix miles. On the eaſt there was no cauſeway, and the city could be approached only by canoes. In each of theſe cauſeways were openings, at proper intervals, through which the waters flowed; and over theſe beams of timber were laid, which being covered with earth, the cauſeway or ſtreet had every where an uniform appearance. As the approaches to the city were ſingular, its conſtruction was remarkable. Not only the temple of their gods, but the houſes belonging to the monarch and to perſons of diſtinction, were of ſuch dimenſions, that, in compariſon with any other buildings which had been diſcovered in America, they might be termed *magnificent*. The habitations of the common people were mean, reſembling the huts of other Indians. But they were all placed in a regular manner, on the banks of the canals which paſſed thro' the city, in ſome of its diſtricts, or on the ſides of the ſtreets which interſected it in other quarters In ſeveral places were large openings or ſquares, one of which, allotted for the great market, is ſaid to have been ſo ſpacious, that 40,000 or 50,000 perſons carried on traffic

traffic there. In this city, the pride of the New World, and the nobleft monument of the induftry and art of man, while unacquainted with the ufe of iron, and deftitute of aid from any domeftic animal, the Spaniards, who are moft moderate in their computations, reckon that there were at leaft 60,000 inhabitants.

But how much foever the novelty of thofe objects might amufe or aftonifh the Spaniards, they felt the utmoft folicitude with refpect to their own fituation. From a concurrence of circumftances, no lefs unexpected than favourable to their progrefs, they had been allowed to penetrate into the heart of a powerful kingdom, and were now lodged in its capital, without having once met with open oppofition from its monarch. The Tlafcalans, however, had earneftly diffuaded them from placing fuch confidence in Montezuma as to enter a city of fuch a peculiar fituation as Mexico, where that prince would have them at mercy, fhut up as it were in a fnare, from which it was impoffible to efcape. They affured them that the Mexican priefts had, in the name of the gods, counfelled their fovereign to admit the ftrangers into the capital, that he might cut them off there at one blow with perfect fecurity. The Spaniards now perceived, too plainly, that the apprehenfions of their allies were not deftitute of foundation; that, by breaking the bridges placed at certain intervals on the caufeways, or by deftroying part of the caufeways themfelves, their retreat would be rendered impracticable, and they muft remain cooped up in the centre of a hoftile city, furrounded by multitudes fufficient to overwhelm them, and without a poffibility of receiving aid from their allies. Montezuma had, indeed, received them with diftinguifhed refpect. But ought they to reckon upon this as real, or to confider it as feigned? Even if it were fincere, could they promife on its continuance? Their fafety depended upon the will of a monarch in whofe attachment they had no reafon to confide; and an order flowing from his caprice, or a word uttered by him in paffion, might decide irrevocably concerning their fate.

Thefe reflections, fo obvious as to occur to the meaneft foldier, did not efcape the vigilant fagacity of their general. Before he fet out from Cholula, Cortes had received advice from Villa Rica, that Qualpopoca, one of the Mexican generals on the frontiers, having affembled an army in order to attack fome of the people whom the Spaniards had encouraged to throw off the Mexican yoke, Efcalante had marched out with part of the garrifon to fupport his allies; that an engagement had enfued, in which, though the Spaniards were victorious, Efcalante, with feven of his men, had been mortally wounded, his horfe killed, and one Spaniard had been furrounded by the enemy and taken alive; that the head of this unfortunate captive, after being carried in triumph to different cities, in order to convince the people that their invaders were not immortal, had been fent to Mexico. Cortes, though alarmed with this intelligence, as an indication of Montezuma's hoftile intentions, had continued his march. But as foon as he entered Mexico, he became fenfible, that, from an excefs of confidence in the fuperior valour and difcipline of his troops, as well as from the difadvantage of having nothing to guide him in an unknown country but the defective intelligence which he received from people with whom his mode of communication was very imperfect, he had pufhed forward into a fituation, where it was difficult to continue, and from which it was dangerous to retire. Difgrace, and perhaps ruin, was the certain confequence of attempting the latter. The fuccefs of his enterprife depended upon fupporting the high opinion which the people of New Spain had formed with refpect to the irrefiftible power of his arms. Upon the firft fymptom of timidity on his part, their veneration would ceafe, and Montezuma, whom fear alone reftrained at prefent, would let loofe upon him the whole force of his empire. At the fame time, he knew that the countenance of his own fovereign was to be obtained only by a feries of victories; and that nothing but the merit of extraordinary fuccefs could fcreen his conduct from the cenfure of irregularity. From all thefe confiderations, it was neceffary to maintain his ftation, and to extricate himfelf out of the difficulties in which one bold ftep had involved him, by venturing upon another ftill bolder. The fituation was trying, but his mind was equal to it; and after revolving the matter with deep attention, he fixed upon a plan no lefs extraordinary than daring. He determined to feize Montezuma in his palace, and carry him a prifoner to the Spanifh quarters. From the fuperftitious veneration of the Mexicans for the perfon of their monarch, as well as their implicit fubmiffion to his will, he hoped, by having Montezuma in his power, to acquire the fupreme direction of their affairs; or at leaft, with fuch a facred pledge in his hands, he made no doubt of being fecure from any effort of their violence.

Mexico.

105 Cortes refolves to feize Montezuma in his palace.

This he immediately propofed to his officers. The timid ftartled at a meafure fo audacious, and raifed objections. The more intelligent and refolute, confcious that it was the only refource in which there appeared any profpect of fafety, warmly approved of it, and brought over their companions fo cordially to the fame opinion, that it was agreed inftantly to make the attempt. At his ufual hour of vifiting Montezuma, Cortes went to the palace, accompanied by Alvarado, Sandoval, Lugo, Velafquez de Leon, and Davila, five of his principal officers, and as many trufty foldiers. Thirty chofen men followed, not in regular order, but fauntering at fome diftance, as if they had no object but curiofity; fmall parties were pofted at proper intervals, in all the ftreets leading from the Spanifh quarters to the court; and the remainder of his troops, with the Tlafcalan allies, were under arms, ready to fally out on the firft alarm. Cortes and his attendants were admitted without fufpicion; the Mexicans retiring, as ufual, out of refpect. He addreffed the monarch in a tone very different from that which he had employed in former conferences; reproaching him bitterly as the author of the violent affault made upon the Spaniards by one of his officers, and demanding public reparation for the lofs which he had fuftained by the death of fome of his companions, as well as for the infult offered to the great prince whofe fervants they were. Montezuma, confounded at this unexpected accufation, and changing colour either from the confcioufnefs of guilt, or from feeling the indignity with which he was treated, afferted his own innocence with great earneftnefs; and, as a proof of it, gave orders inftantly to bring Qualpopoca and his accomplices prifoners to Mexico. Cortes replied, with feeming complaifance, that a declaration fo refpectable left no doubt remaining

Mexico. remaining in his own mind; but that something more was requisite to satisfy his followers, who would never be convinced that Montezuma did not harbour hostile intentions against them, unless, as an evidence of his confidence and attachment, he removed from his own palace and took up his residence in the Spanish quarters, where he should be served and honoured as became a great monarch. The first mention of so strange a proposal bereaved Montezuma of speech, and almost of motion. At length he haughtily answered, "That persons of his rank were not accustomed voluntarily to give up themselves as prisoners; and were he mean enough to do so, his subjects would not permit such an affront to be offered to their sovereign." Cortes, unwilling to employ force, endeavoured alternately to soothe and intimidate him. The altercation became warm; and having continued above three hours, Velasquez de Leon, an impetuous and gallant young man, exclaimed with impatience, "Why waste more time in vain? Let us either seize him instantly, or stab him to the heart." The threatening voice and fierce gestures with which these words were uttered, struck Montezuma. The Spaniards, he was sensible, had now proceeded so far, as left him no hope that they would recede. His own danger was imminent, the necessity unavoidable. He saw both; and abandoning himself to his fate, complied with their request.

106 The emperor carried to the Spanish quarters.

His officers were called. He communicated to them his resolution. Though astonished and afflicted, they presumed not to question the will of their master, but carried him in silent pomp, all bathed in tears, to the Spanish quarters. When it was known that the strangers were conveying away the emperor, the people broke out into the wildest transports of grief and rage, threatening the Spaniards with immediate destruction, as the punishment justly due to their impious audacity. But as soon as Montezuma appeared with a seeming gaiety of countenance, and waved his hand, the tumult was hushed; and upon his declaring it to be of his own choice that he went to reside for some time among his new friends, the multitude, taught to revere every intimation of their sovereign's pleasure, quietly dispersed.

The Spaniards at first pretended to treat Montezuma with great respect; but soon took care to let him know that he was entirely in their power. Cortes wished that the shedding the blood of a Spaniard should appear the most heinous crime that could be committed; and therefore not only took a most exemplary vengeance on those who had been concerned in the affair of Villa Rica, but even put the emperor himself in chains till the execution of the Mexican general was over. By these, and other insults, he at last gained entirely the ascendant over this unhappy monarch; and he took care to improve his opportunity to the utmost. He sent his emissaries into different parts of the kingdom, accompanied with Mexicans of distinction, who might serve both to guide and to protect them. They visited most of the provinces, viewed their soil and productions, surveyed with particular care the districts which yielded gold or silver, pitched upon several places as proper for future colonies, and endeavoured to prepare the minds of the people for submitting to the Spanish yoke: and while they were thus employed, Cortes, in the name and by the authority of Montezuma, degraded some of the principal officers in the empire, whose abilities or independent

107 Cortes rules the empire.

spirit excited his jealousy; and substituted in their place persons who he imagined would be more obsequious. One thing, however, was still wanting to complete his security. He wished to have such a command of the lake as might ensure a retreat, if, either from levity or disgust, the Mexicans should take arms against him, and break down the bridges or causeways, in order to inclose him in the city. In order to obtain this without giving disgust to the emperor or his court, Cortes artfully inflamed the curiosity of the Indians with accounts of the Spanish shipping, and those floating palaces that moved with such velocity on the water, without the assistance of oars; and when he found that the monarch himself was extremely desirous of seeing such a novelty, he gave him to understand, that nothing was wanting to his gratification besides a few necessaries from Vera Cruz, for that he had workmen in his army capable of building such vessels. The bait took with Montezuma; and he gave immediate orders that all his people should assist Cortes in whatever he should direct concerning the shipping. By this means, in a few days, two brigantines were got ready, full-rigged and equipped; and Montezuma was invited on board, to make the first trial of their sailing, of which he could form no idea. Accordingly he embarked for this purpose, and gave orders for a great hunting upon the water, in order that all his people might be diverted with the novelty presented by the Spaniards. On the day appointed, the royal equipage was ready early in the morning; and the lake was covered with a multitude of boats and canoes loaded with people. The Mexicans had augmented the number of their rowers on board the royal barges, with an intention to disgrace the Spanish vessels, which they regarded as clumsy, unwieldy, and heavy. But they were soon undeceived; a fresh gale started up, the brigantines hoisted sail, to the utter astonishment of all the spectators, and soon left all the canoes behind; while the monarch exulted in the victory of the Spaniards, without once considering that now he had effectually rivetted his own chains.

108 By a pretence obtains leave to build brigantines on the lake.

109 Montezuma owns himself vassal to the king of Spain.

Cortes having obtained this important point, resolved to put the condescension of the emperor to a trial still more severe. He urged Montezuma to acknowledge himself a vassal to the crown of Castile; to hold his crown of him as superior, and to subject his dominions to the payment of an annual tribute. With this requisition, humiliating as it was, Montezuma complied. He called together the chief men of his empire, and, in a solemn harangue, reminded them of the traditions and prophecies which led them to expect the arrival of a people sprung from the same stock with themselves, in order to take possession of the supreme power; he declared his belief that the Spaniards were this promised race; and that therefore he recognised the right of their monarch to govern the Mexican empire, would lay his crown at his feet, and obey him as a tributary. While uttering these words, Montezuma discovered how deeply he was affected in making such a sacrifice. Tears and groans frequently interrupted his discourse. The first mention of such a resolution struck the assembly dumb with astonishment. This was followed by a sullen murmur of sorrow mingled with indignation; which indicated some violent eruption of rage to be near at hand. This Cortes foresaw, and seasonably interposed to prevent it, by declaring that

that his maſter had no intention to deprive Montezuma of the royal dignity, or to make any innovation upon the conſtitution and laws of the Mexican empire. This aſſurance, added to their dread of the Spaniſh arms, and the authority of their monarch's example, extorted the conſent of the aſſembly; and the act of ſubmiſſion and homage was executed with all the formalities which the Spaniards pleaſed to preſcribe.

Montezuma, at the requeſt of Cortes, accompanied this profeſſion of fealty and homage with a magnificent preſent to his new ſovereign; and, after his example, his ſubjects brought in very liberal contributions. The Spaniards then collected all the treaſure which had been either voluntarily beſtowed upon them at different times by Montezuma, or had been extorted from his people under various pretences; and having melted the gold and ſilver, the value of theſe, without including jewels and ornaments of various kinds, which were preſerved on account of their curious workmanſhip, amounted to 600,000 peſos. The ſoldiers were impatient to have it divided; and Cortes complied with their deſire. A fifth of the whole was ſet apart as the tax due to the king. Another fifth was allowed to Cortes as commander. The ſums advanced by the governor of Cuba, who had originally fitted out the expedition, were then deducted. The remainder was then divided among the army, including the garriſon of Vera Cruz, in proportion to their different ranks; and after ſo many deductions, the ſhare of a private man did not exceed 100 peſos. This ſum fell ſo far below their ſanguine expectations, that it required all the addreſs, and no ſmall exertions of the liberality of Cortes, to prevent an open mutiny. However, he at laſt reſtored tranquillity; but had no ſooner eſcaped this danger, than he involved himſelf, by his imprudent zeal for religion, in one much worſe. Montezuma, though often importuned, had obſtinately refuſed to change his religion, or aboliſh the ſuperſtitious rites which had been for ſuch a long time practiſed throughout his dominions. This at laſt tranſported the Spaniard with ſuch rage, that, in a ſally of zeal, he led out his ſoldiers in order to throw down the idols in the great temple by force. But the prieſts taking arms in defence of their altars, and the people crowding with great ardour to ſupport them, Cortes's prudence over-ruled his zeal, and induced him to deſiſt from his raſh attempt, after diſlodging the idols from one of the ſhrines, and placing in their ſtead an image of the Virgin Mary.

From this moment the Mexicans began to meditate the expulſion or the deſtruction of the Spaniards. The prieſts and leading men held frequent meetings with Montezuma for this purpoſe. But as any violent attempt might have proved fatal to the captive monarch, it was thought proper firſt to try more gentle means. Having called Cortes into his preſence, he obſerved, that now, as all the purpoſes of his embaſſy were fully accompliſhed, the gods had declared their will, and the people ſignified their deſire, that he and his followers ſhould inſtantly depart out of the empire. With this he required them to comply, or unavoidable deſtruction would fall ſuddenly on their heads. This unexpected requiſition, as well as the manner in which it was delivered, alarmed Cortes. However, he ſuppoſed that more might be gained by a feigned compliance than by open reſiſtance; and therefore replied with great compoſure, that he had already begun to prepare for his return; but as he had deſtroyed the veſſels in which he arrived, ſome time was requiſite for building other ſhips. This appeared reaſonable; and a number of Mexicans were ſent to Vera Cruz to cut down timber, and ſome Spaniſh carpenters were appointed to ſuperintend the work.

114 An armament ſent from Cuba againſt Cortes.

Cortes flattered himſelf, that, during this interval, he might either find means to avert the threatened danger, or receive ſuch reinforcements as would enable him to defend himſelf. Nine months had now elapſed ſince Portocarrero and Montejo had ſailed with his diſpatches to Spain; and he daily expected a return with a confirmation of his authority from the king, without which all that he had done ſerved only to mark him out as an object of puniſhment. While he remained in great anxiety on this account, news were brought that ſome ſhips had appeared on the coaſt. Theſe were imagined by Cortes to be a reinforcement ſent him from Spain: but his joy was of ſhort continuance, for a courier very ſoon arrived from Vera Cruz, with certain information that the armament was fitted out by Velaſquez, the governor of Cuba; and inſtead of bringing ſuccours, threatened them with immediate deſtruction.

Velaſquez had been excited to this hoſtile meaſure chiefly through the indiſcretion, or rather treachery, of the meſſengers of Cortes; who, contrary to his expreſs injunctions, had landed on the iſland of Cuba, and given intelligence of all that had paſſed: and Velaſquez, tranſported with rage at hearing of the proceedings of Cortes, had now ſent againſt him this armament; conſiſting of 18 ſhips, which carried 80 horſemen, 800 infantry, of which 80 were muſketeers, and 120 croſs-bowmen, commanded by a brave officer named *Pamphilo de Narvaez*; whoſe inſtructions were, to ſeize Cortes and his principal officers, to ſend them priſoners to him, and then to complete the diſcovery and conqueſt of the country in his name. This proved a moſt afflicting piece of news to Cortes. However, thinking it imprudent to attempt any thing againſt his countrymen at firſt by force, he ſent his chaplain Olmedo with propoſals of accommodation. Narvaez rejected his propoſals with ſcorn; but his followers were leſs violent in their reſentments. Olmedo delivered many letters to them, either from Cortes himſelf, or from his officers their ancient friends and companions. Theſe Cortes had artfully accompanied with preſents of rings, chains of gold, and other trinkets of value; which inſpired thoſe needy adventurers with high ideas of the wealth he had acquired, and with envy of the good fortune of thoſe who were engaged in his ſervice. Some, from hopes of becoming ſharers in theſe rich ſpoils, declared for an immediate accommodation; while others were for the ſame pacific meaſure, through fear of ſubverting the Spaniſh power entirely in a country where it was ſo imperfectly eſtabliſhed. Narvaez diſregarded both; and, by a proclamation, denounced Cortes and his adherents rebels and enemies to their country.

115 Which is defeated by that general.

Cortes having now no reſource but in war, left 150 men under the command of Pedro de Alvarado, an officer of great bravery, and much reſpected by

Mexico.

by the Mexicans, to guard the capital and the captive emperor; while he himfelf marched with the remainder, to meet his formidable opponent, who had taken poffeffion of Zempoalla. Even after being reinforced by Sandoval his governor of Vera Cruz, the force of Cortes did not exceed 250 men. He hoped for fuccefs chiefly from the rapidity of his motions and the poffibility of furprifing his enemies; and as he chiefly dreaded their cavalry, he armed his foldiers with long fpears, accuftoming them to that deep and compact arrangement which the ufe of this formidable weapon enabled them to affume. As he advanced, however, he repeated his propofals of accommodation: but thefe being conftantly rejected, and a price fet upon his head, he at laft attacked Narvaez in the night-time, entirely defeated and took him prifoner, obliging all his troops to own allegiance to himfelf.

Nothing could be more feafonable than this victory, by which Cortes found his army very confiderably increafed; for moft of the foldiers of Narvaez chofe rather to follow Cortes than to return to Cuba, whither the conqueror had offered to fend them if they chofe. His affairs at Mexico, in the mean time, were in the utmoft danger of being totally ruined; and had this decifive victory been delayed but a few days longer, he muft have come too late to fave his companions. A fhort time after the defeat of Narvaez, a courier arrived from Mexico with the difagreeable intelligence that the Mexicans had taken arms; and having feized and deftroyed the two brigantines which he had built in order to fecure the command of the lake, had attacked the Spaniards in their quarters, killed fome, and wounded many more, burnt their magazine of provifions, and, in fhort, carried on hoftilities with fuch fury, that though Alvarado and his men defended themfelves with undaunted refolution, they muft either be cut off by famine, or fink under the multitude of their enemies. This revolt was excited by motives which rendered it ftill more alarming. On the departure of Cortes for Zempoalla, the Mexicans flattered themfelves, that the long-expected opportunity of reftoring their fovereign to liberty, and driving out the Spaniards, was arrived; and confultations were accordingly held for bringing about both thefe events. The Spaniards in Mexico, confcious of their own weaknefs, fufpected and dreaded thefe machinations; but Alvarado, who had neither the prudence nor the addrefs of Cortes, took the worft method imaginable to overcome them. Inftead of attempting to foothe or cajole the Mexicans, he waited the return of one of their folemn feftivals, when the principal perfons in the empire were dancing, according to cuftom, in the court of the great temple; he feized all the avenues which led to it; and, allured partly by the rich ornaments which they wore in honour of their gods, and partly by the facility of cutting off at once the authors of that confpiracy which he dreaded, he fell upon them, unarmed and unfufpicious of danger, and maffacred a great number; none efcaping but fuch as made their way over the battlements of the temple. An action fo cruel and treacherous filled not only the city, but the whole empire, with indignation and rage; and the Mexicans immediately proceeded in the manner abovementioned.

116
Danger us fituation of the Spaniards left at Mexico.

Mex.

Cortes advanced with the utmoft celerity to the relief of his diftreffed companions; but as he paffed along, had the mortification to find that the Spaniards were generally held in abhorrence. The principal inhabitants had deferted the towns through which he paffed; no perfon of note appeared to meet him with the ufual refpect; nor were provifions brought to his camp as ufual. Notwithftanding thefe figns of averfion and horror, however, the Mexicans were fo ignorant of the military art, that they again permitted him to enter the capital without oppofition; though it was in their power to have eafily prevented him, by breaking down the bridges and caufeways which led to it.

11[7]
Corte[s] lowe[d] retur[n to] Mexi[co]

Cortes was received by his companions with the utmoft joy; and this extraordinary fuccefs fo far intoxicated the general himfelf, that he not only neglected to vifit Montezuma, but expreffed himfelf very contemptuoufly concerning him. Thefe expreffions being reported among the Mexicans, they all at once flew to arms, and made fuch a violent and fudden attack, that all the valour and fkill of Cortes were fcarce fufficient to repel them. This produced great uneafinefs among the foldiers of Narvaez, who had imagined there was nothing to do but to gather the fpoils of a conquered country. Difcontent and murmurings, however, were now of no avail; they were inclofed in an hoftile city, and, without fome extraordinary exertions, were inevitably undone. Cortes therefore, made a defperate fally; but, after exerting his utmoft efforts for a whole day, was obliged to retire with the lofs of 12 killed, and upwards of 60 wounded. Another fally was attempted with the like bad fuccefs, and in it Cortes himfelf was wounded in the hand.

11[8]
But i[s] to[...] tacked [by] the na tives.

The Spanifh general was now thoroughly convinced of his error; and therefore betook himfelf to the only refource which was left; namely, to try what effect the interpofition of Montezuma would have to foothe or overawe his fubjects. When the Mexicans approached the next morning to renew the affault, that unfortunate prince, at the mercy of the Spaniards, and reduced to the fad neceffity of becoming the inftrument of his own difgrace, and of the flavery of his people, advanced to the battlements in his royal robes, and with all the pomp in which he ufed to appear on folemn occafions. At the fight of their fovereign, whom they had been long accuftomed to reverence almoft as a god, the Mexicans inftantly forebore their hoftilities, and many proftrated themfelves on the ground: but when he addreffed them in favour of the Spaniards, and made ufe of all the arguments he could think of to mitigate their rage, they teftified their refentment with loud murmurings; and at length broke forth with fuch fury, that before the foldiers, appointed to guard Montezuma, had time to cover him with their fhields, he was wounded with two arrows, and a blow on his temple with a ftone ftruck him to the ground. On feeing him fall, the Mexicans inftantly fled with the utmoft precipitation: but the unhappy monarch, now convinced that he was become an object of contempt even to his own fubjects, obftinately refufed

119
Montez[u]ma kill[ed]

refuſed all nouriſhment; and thus in a ſhort time ended his days.

On the death of Montezuma, Cortes having loſt all hope of bringing the Mexicans to any terms of peace, prepared for retreat. But his antagoniſts, having taken poſſeſſion of a high tower in the great temple, which overlooked the Spaniſh quarters, and placing there a garriſon of their principal warriors, the Spaniards were ſo much expoſed to their miſſile weapons, that none could ſtir without danger of being killed or wounded. From this poſt, therefore, it was neceſſary to diſlodge them at any rate; and Juan de Eſcobar, with a large detachment of choſen ſoldiers, was ordered to make the attack. But Eſcobar, though a valiant officer, and though he exerted his utmoſt efforts, was thrice repulſed. Cortes, however, ſenſible that not only his reputation, but the ſafety of his army, depended on the ſucceſs of this aſſault, cauſed a buckler to be tied to his arm, as he could not manage it with his wounded hand, and ruſhed with his drawn ſword among the thickeſt of the combatants. Encouraged by the preſence of their general, the Spaniards returned to the charge with ſuch vigour, that they gradually forced their way up the ſteps, and drove the Mexicans to the platform at the top of the tower. There a dreadful carnage began; when two young Mexicans of high rank, obſerving Cortes, as he animated his ſoldiers, reſolved to ſacrifice their own lives in order to cut off the author of ſo many calamities which deſolated their country. They approached him in a ſuppliant poſture, as if they intended to lay down their arms; and ſeizing him in a moment, hurried him towards the battlements, over which they threw themſelves headlong, in hopes of dragging him along with them. But Cortes, by his ſtrength and agility, diſengaged himſelf from their graſp; ſo that the two Mexicans periſhed alone.

As ſoon as the Spaniards became maſters of the tower, they ſet fire to it, and without further moleſtation continued the preparations for their retreat. This became the more neceſſary, as their enemies, aſtoniſhed at this laſt effort of their valour, had now entirely changed their ſyſtem of hoſtility; and, inſtead of inceſſant attacks, endeavoured, by barricading the ſtreets, and breaking down the cauſeways, to cut off the communication of the Spaniards with the continent, and thus to ſtarve an enemy whom they could not ſubdue. The firſt point to be determined was, whether they ſhould march out openly in the face of day, when they could diſcern every danger, or whether they ſhould endeavour to retire ſecretly in the night. The latter was preferred, partly from hopes that the ſuperſtition of the Mexicans would prevent them from attacking them in the night, and partly from their own ſuperſtition in giving credit to the predictions of a private ſoldier, who pretended to aſtrology, and aſſured them of ſucceſs if they retreated in this manner. Towards midnight, therefore, they began their march, in three diviſions. Sandoval led the van; Pedro Alvarado and Velaſquez de Leon had the conduct of the rear; and Cortes commanded in the centre, where he placed the priſoners, among whom were a ſon and two daughters of Montezuma, together with ſeveral Mexicans of diſtinction; the artillery, baggage, and a portable bridge of timber intended to be laid over the breaches in the cauſeway. They marched in profound ſilence along the cauſeway which led to Tacuba, becauſe it was ſhorter than any of the reſt, and, lying moſt remote from the road towards Tlaſcala and the ſea coaſt, had been left moſt entire by the Mexicans.

121
Cortes retreats with great loſs.

They reached the firſt breach in the cauſeway without moleſtation, hoping that their retreat was undiſcovered. But the Mexicans had not only watched all their motions, but made preparations for a moſt formidable attack. While the Spaniards were intent upon placing their bridges in the breach, and occupied in conducting their horſes and artillery along it, they were ſuddenly alarmed with the ſound of warlike inſtruments, and found themſelves aſſaulted on all ſides by an innumerable multitude of enemies. Unfortunately the wooden bridge was wedged ſo faſt in the mud by the weight of the artillery, that it was impoſſible to remove it. Diſmayed at this accident, the Spaniards advanced with precipitation to the ſecond breach. The Mexicans hemmed them in on every ſide; and though they defended themſelves with their uſual courage, yet, crowded as they were in a narrow cauſeway, their diſcipline and military ſkill were of little avail; nor did the obſcurity of the night allow them to derive much advantage from their fire-arms or the ſuperiority of their other weapons. At laſt the Spaniards, overborne with the numbers of their enemies, began to give way, and in a moment the confuſion was univerſal. Cortes, with about 100 foot-ſoldiers, and a few horſe, forced his way over the two remaining breaches in the cauſeway, the bodies of the dead ſerving to fill up the chaſms, and reached the main land. Having formed them as ſoon as they arrived, he returned with ſuch as were yet capable of ſervice, to aſſiſt his friends in their retreat. He met with part of his ſoldiers who had forced their way through the enemy, but found many more overwhelmed by the multitude of their aggreſſors, or periſhing in the lake; and heard the grievous lamentations of others whom the Mexicans were carrying off in triumph to be ſacrificed to the god of war.

In this fatal retreat more than one half of Cortes's army periſhed, together with many officers of diſtinction. All the artillery, ammunition, and baggage, were loſt; the greater part of the horſes and above 2000 Tlaſcalans were killed, and only a very ſmall part of their treaſure ſaved. The firſt care of the Spaniſh general was to find ſome ſhelter for his wearied troops; for, as the Mexicans infeſted them on every ſide, and the people of Tacuba began to take arms, he could not continue in his preſent ſtation. At laſt he diſcovered a temple ſeated on an eminence, in which he found not only the ſhelter he wanted, but ſome proviſions; and though the enemy did not intermit their attacks throughout the day, they were without much difficulty prevented from making any impreſſion. For ſix days after, they continued their march through a barren, ill cultivated, and thinly peopled country, where they were often obliged to feed on berries, roots, and the ſtalks of green maize; at the ſame time they were haraſſed without intermiſſion by large parties of Mexicans, who attacked them on all ſides. On the ſixth day they reached Otumba, not far from the road between Mexico and Tlaſcala. Early next morning they

Mexico.

they began to advance towards it, flying parties of the enemy ſtill hanging on their rear; and amidſt the inſults with which they accompanied their hoſtilities, Donna Marina remarked, that they often exclaimed with exultation, "Go on, robbers; go to the place where you ſhall quickly meet the vengeance due to your crimes." The meaning of this threat the Spaniards did not comprehend, until they reached the ſummit of an eminence before them. There a ſpacious valley opened to their view, covered with a vaſt army as far as the eye could reach. The Mexicans, while with one body of their troops they haraſſed the Spaniards in their retreat, had aſſembled their principal force on the other ſide of the lake; and marching along the road which led directly to Tlaſcala, poſted it in the plain of Otumba, through which they knew Cortes muſt paſs. At the ſight of this incredible multitude, which they could ſurvey at once from the riſing ground, the Spaniards were aſtoniſhed, and even the boldeſt began to deſpair. But Cortes, without allowing their fears time to operate, after warning them briefly that no alternative remained but to conquer or die, led them inſtantly to the charge. The Mexicans waited their approach with unuſual fortitude: yet ſuch was the ſuperiority of the Spaniſh diſcipline and arms, that the impreſſion of this ſmall body was irreſiſtible; and which ever way its force was directed, it penetrated and diſperſed the moſt numerous battalions. But while theſe gave way in one quarter, new combatants advanced from another; and the Spaniards, though ſucceſsful in every attack, were ready to ſink under theſe repeated efforts, without ſeeing any end to their toil, or any hope of victory. At that time Cortes obſerved the great ſtandard of the empire, which was carried before the Mexican general, advancing; and fortunately recollecting to have heard, that on the fate of it depended the event of every battle, he aſſembled a few of his braveſt officers, whoſe horſes were ſtill capable of ſervice, and, placing himſelf at their head, puſhed towards the ſtandard with ſuch impetuoſity that he bore down every thing before him. A choſen body of nobles, who guarded the ſtandard, made ſome reſiſtance, but were ſoon broken. Cortes, with a ſtroke of his lance, wounded the Mexican general, and threw him to the ground. One of his followers alighting, put an end to his life, and laid hold of the imperial ſtandard. The moment that their leader fell, and the ſtandard, towards which all directed their eyes, diſappeared, an univerſal panic ſtruck the Mexicans; and, as if the bond which held them together had been diſſolved, every enſign was lowered, each ſoldier threw away his weapons, and fled with precipitation to the mountains. The Spaniards, unable to purſue them far, returned to collect the ſpoils of the field; and theſe were ſo valuable as to be ſome compenſation for the wealth which they had loſt in Mexico; for in the enemy's army were moſt of their principal warriors dreſſed out in their richeſt ornaments, as if they had been marching to aſſured victory.

122 The battle of Otumba.

123 Mexicans defeated.

The day after this important action (being July 8th 1520), the Spaniards entered the Tlaſcalan territories, where they were received with the moſt cordial friendſhip. Cortes endeavoured to avail himſelf of this diſpoſition as much as poſſible; for which purpoſe he diſtributed among them the rich ſpoils taken at Otumba with ſuch a liberal hand, that he made himſelf ſure of obtaining from the republic whatever he ſhould deſire. He drew a ſmall ſupply of ammunition, and two or three field-pieces, from his ſtores at Vera Cruz. He diſpatched an officer of confidence with four ſhips of Narvaez's fleet to Hiſpaniola and Jamaica, to engage adventurers, and to purchaſe horſes, gunpowder, and other military ſtores. And as he knew that it would be in vain to attempt the reduction of Mexico, unleſs he could ſecure the command of the lake, he gave orders to prepare, in the mountains of Tlaſcala, materials for building 12 brigantines, ſo that they might be carried thither in pieces, ready to be put together, and launched when he ſtood in need of their ſervice. But, in the mean time, his ſoldiers, alarmed at the thoughts of being expoſed to ſuch calamities a ſecond time, preſented a remonſtrance to their general, in which they repreſented the imprudence of attacking a powerful empire with his ſhattered forces, and formally required him to return back to Cuba. All the eloquence of Cortes could now only prevail with them to delay their departure for ſome time, when he promiſed to diſmiſs ſuch as ſhould deſire it. However, this was only a pretence; for Cortes, in fact, had the conqueſt of Mexico as much at heart as ever. Without giving his ſoldiers an opportunity of caballing, therefore, he daily employed them againſt the people of the neighbouring provinces, who had cut off ſome detachments of Spaniards during his misfortunes at Mexico; and by which, as he was conſtantly attended with ſucceſs, his men ſoon reſumed their wonted ſenſe of ſuperiority.

124 Cortes receives an unexpected reinforcement.

But all the efforts of Cortes could have been of little avail, had he not unexpectedly obtained a reinforcement of Spaniſh ſoldiers. The governor of Cuba, to whom the ſucceſs of Narvaez appeared an event of infallible certainty, having ſent two ſmall ſhips after him with new inſtructions, and a ſupply of men and military ſtores, the officer whom Cortes had appointed to command on the coaſt artfully decoyed them into the harbour of Vera Cruz, ſeized the veſſels, and eaſily perſuaded the ſoldiers to follow the ſtandard of a more able leader than him whom they were deſtined to join. Soon after, three ſhips of more conſiderable force came into the harbour ſeparately. Theſe belonged to an armament fitted out by Franciſco de Garay, governor of Jamaica, who had long aimed at dividing with Cortes the glory and gain of annexing the empire of Mexico to the crown of Caſtile. They had, however, unadviſedly made their atempt on the northern provinces, where the country was poor, and the inhabitants fierce and warlike; ſo that, after a ſucceſſion of diſaſters, they were now obliged to venture into Vera Cruz, and caſt themſelves upon the mercy of their countrymen; and here they alſo were ſoon perſuaded to throw off their allegiance to their maſter, and to enliſt with Cortes. About the ſame time a ſhip arrived from Spain, freighted by ſome private adventurers, with military ſtores; and the cargo was eagerly purchaſed by Cortes, while the crew, following the example of the reſt joined him at Tlaſcala.

From theſe various quarters, the army of Cortes was

was augmented with 180 men and 20 horfes; by which means he was enabled to difmifs fuch of the foldiers of Narvaez as were moft troublefome and difcontented; after the departure of whom he ftill muftered 550 infantry, of whom 80 were armed with mufkets or crofs-bows, 40 horfemen, and nine pieces of artillery. At the head of thefe, with 10,000 Tlafcalans and other friendly Indians, he began his march towards Mexico, on the 28th of December, fix months after his fatal retreat from that city.

The Mexicans, in the mean time, had made the beft preparations they could for oppofing fuch a formidable enemy. On the death of Montezuma, his brother Quetlavaca was raifed to the throne; and he had an immediate opportunity of fhowing that he was worthy of their choice, by conducting in perfon thofe fierce attacks which obliged the Spaniards to retire from his capital. His prudence in guarding againft the return of the invaders was equal to the fpirit he had fhown in driving them out. He repaired what the Spaniards had ruined in the city, ftrengthened it with fuch fortifications as his people could erect; and befides filling his magazines with the ufual implements of war, gave directions to make long fpears, headed with the fwords and daggers which they had taken from the Spaniards, in order to annoy the cavalry. But in the midft of thefe preparations he was taken off by the fmall-pox; and Guatimozin, his nephew and fon-in-law, raifed to the throne.

As foon as Cortes entered the enemy's territories, he difcovered various preparations to obftruct his progrefs. But his troops forced their way with little difficulty; and took poffeffion of Tezeuco, the fecond city of the empire, fituated on the banks of the lake, about 20 miles from Mexico. Here he determined to eftablifh his head-quarters, as the moft proper ftation for launching his brigantines, as well as for making his approaches to the capital. In order to render his refidence there more fecure, he depofed the cazique or chief, who was at the head of that community, under pretence of fome defect in his title, and fubftituted in his place a perfon whom a faction of the nobles pointed out as the right heir of that dignity. Attached to him by this benefit, the new cazique and his adherents ferved the Spaniards with inviolable fidelity.

As the conftruction of the brigantines advanced flowly under the unfkilful hands of foldiers and Indians, whom Cortes was obliged to employ in affifting three or four carpenters who happened fortunately to be in his fervice, and as he had not yet received the reinforcement which he expected from Hifpaniola, he was not in a condition to turn his arms directly againft the capital. To have attacked a city fo populous, fo well prepared for defence, and in a fituation of fuch peculiar ftrength, muft have expofed his troops to inevitable deftruction. Three months elapfed before the materials for conftructing the brigantines were finifhed, and before he heard any thing with refpect to the fuccefs of his negociation in Hifpaniola. This, however, was not a feafon of inaction to Cortes. He attacked fucceffively feveral of the towns fituated around the lake; and though all the Mexican power was exerted to obftruct his operations, he either compelled them to fubmit to the Spanifh crown, or reduced them to ruins. Other towns he endeavoured to conciliate by more gentle means; and though he could not hold any intercourfe with the inhabitants but by the intervention of interpreters, yet, under all the difadvantage of that tedious and imperfect mode of communication, he had acquired fuch thorough knowledge of the ftate of the country, as well as of the difpofitions of the people, that he conducted his negociations and intrigues with aftonifhing dexterity and fuccefs. Moft of the cities adjacent to Mexico were originally the capitals of fmall independent ftates; and fome of them having been but lately annexed to the Mexican empire, ftill retained the remembrance of their ancient liberty, and bore with impatience the rigorous yoke of their new mafters. Cortes having early obferved fymptoms of their difaffection, availed himfelf of this knowledge to gain their confidence and friendfhip. By offering with confidence to deliver them from the odious dominion of the Mexicans, and by liberal promifes of more indulgent treatment if they would unite with him againft their oppreffors, he prevailed on the people of feveral confiderable diftricts, not only to acknowledge the king of Caftile as their fovereign, but to fupply the Spanifh camp with provifions, and to ftrengthen his army with auxiliary troops. Guatimozin, on the firft appearance of defection among his fubjects, exerted himfelf with vigour to prevent or to punifh their revolt; but, in fpite of his efforts, the fpirit continued to fpread. The Spaniards gradually acquired new allies; and with deep concern he beheld Cortes arming againft his empire thofe very hands which ought to have been active in his defence, and ready to advance againft the capital at the head of a numerous body of his own fubjects.

While, by thefe various methods, Cortes was gradually circumfcribing the Mexican power within fuch narrow limits that his profpect of overturning it feemed neither to be uncertain nor remote, all his fchemes were well nigh defeated by a confpiracy againft his own perfon, and which was difcovered only a fhort time before it was to have been executed. Though many were concerned, Cortes did not think proper to punifh any more than the principal ringleader, whom he caufed immediately to be hanged; and then, without allowing them leifure to ruminate on what had happened, and as the moft effectual means of preventing the return of a mutinous fpirit, he determined to call forth his troops immediately to action. Fortunately a proper occafion for this occurred, without his feeming to court it. He received intelligence, that the materials for building the brigantines were at length completely finifhed, and waited only for a body of Spaniards to conduct them to Tezeuco. The command of this convoy, confifting of 200 foot-foldiers, 15 horfemen, and 2 field-pieces, he gave to Sandoval, who by the vigilance, activity, and courage, which he manifefted on every occafion, was growing daily in his confidence, and in the eftimation of his fellow-foldiers. The fervice was no lefs fingular than important; the beams, the planks, the mafts, the cordage, the fails, the iron work, and all the infinite variety of articles requifite for the conftruction of 13 brigantines were to be carried 60 miles over land, thro' a mountainous country, by people who were unacquainted with the miniftry of domeftic animals, or the aid of machines to facilitate any work of labour. The

Tlaf-

Mexico Tlascalans furnished 8000 *Tamenes*, an inferior order of men destined for servile tasks, to carry the materials on their shoulders, and appointed 15,000 warriors to accompany and defend them. Sandoval made the disposition for their progress with great propriety, placing the Tamenes in the centre, one body of warriors in the front, another in the rear, with considerable parties to cover the flanks. To each of these he joined some Spaniards, not only to assist them in danger, but to accustom them to regularity and subordination. Parties of Mexicans frequently appeared hovering around them on the high grounds: but perceiving no prospect of success in attacking an enemy continually on his guard, and prepared to receive them, they did not venture to molest him; and Sandoval had the glory of conducting safely to Tezeuco a convoy on which all the future operations of his countrymen depended.

128
The Spaniards receive another reinforcement.

This was followed by another event of no less moment. Four ships arrived at Vera Cruz from Hispaniola, with 200 soldiers, 80 horses, two battering cannon, and a considerable supply of ammunition and arms. Elevated with observing that all his preparatory schemes, either for recruiting his own army or impairing the force of the enemy, had now produced their full effect, Cortes, impatient to begin the siege in form, hastened the launching of the brigantines. To facilitate this, he had employed a vast number of Indians, for two months, in deepening the small rivulet which runs by Tezeuco into the lake, and in forming it into a canal near two miles in length; and though the Mexicans, aware of his intentions, as well as of the danger which threatened them, endeavoured frequently to interrupt the labourers, or to burn the brigantines, the work was at last completed. On the 28th of April, all the Spanish troops, together with auxiliary Indians, were drawn up on the banks of the canal; and with extraordinary military pomp, heightened and rendered more solemn by the celebration of the most sacred rites of religion, the brigantines were launched. As they fell down the canal in order, Father Olmedo blessed them, and gave each its name. Every eye followed them with wonder and hope, until they entered the lake, when they hoisted their sails, and bore away before the wind. A general shout of joy was raised; all admiring that bold inventive genius, which, by means so extraordinary, that their success almost exceeded belief, had acquired the command of a fleet, without the aid of which Mexico would have continued to set the Spanish power and arms at defiance.

129
The city besieged.

Cortes determined to attack the city from three different quarters; from Tezeuco on the east side of the lake, from Tacuba on the west, and from Cuyocan towards the south. Those towns were situated on the principal causeways which led to the capital, and intended for their defence. He appointed Sandoval to command in the first, Pedro de Alvarado in the second, and Christoval de Olid in the third; allotting to each a numerous body of Indian auxiliaries, together with an equal division of Spaniards, who, by the junction of the troops from Hispaniola, amounted now to 86 horsemen, and 818 foot-soldiers; of whom 118 were armed with muskets or cross-bows. Their train of artillery consisted of three battering cannon, and 15 field-pieces. He reserved for himself, as the station of greatest importance and danger, the conduct of the brigantines, each armed with one of his small cannon, and manned with 25 Spaniards.

As Alvarado and Olid proceeded towards the posts assigned them, they broke down the aqueducts which the ingenuity of the Mexicans had erected for conveying water into the capital, and, by the distress to which this reduced the inhabitants, gave a beginning to the calamities which they were destined to suffer. Alvarado and Olid found the towns, of which they were ordered to take possession, deserted by their inhabitants, who had fled for safety to the capital, where Guatimozin had collected the chief force of his empire, as there alone he could hope to make a successful stand against the formidable enemies who were approaching to assault him.

130
The Spaniards defeat the Mexicans and become masters of the lake.

The first effort of the Mexicans was to destroy the fleet of brigantines, the fatal effects of whose operations they foresaw and dreaded. Though the brigantines, after all the labour and merit of Cortes in forming them, were of inconsiderable bulk, rudely constructed, and manned chiefly with landmen, hardly possessed of skill enough to conduct them, they must have been ojects of terror to a people unacquainted with any navigation but that of their lake, and possessed of no vessel larger than a canoe. Necessity, however, urged Guatimozin to hazard the attack; and hoping to supply by numbers what he wanted in force, he assembled such a multitude of canoes as covered the face of the lake. They rowed on boldly to the charge, while the brigantines, retarded by a dead calm, could scarcely advance to meet them. But as the enemy drew near, a breeze suddenly sprung up; in a moment the sails were spread, and the brigantines with irresistible impetuosity broke their feeble opponents, overset many canoes, and dissipated the whole armament with such slaughter, as convinced the Mexicans, that the progress of the Europeans in knowledge and arts rendered their superiority greater on this new element than they had hitherto found it by land.

From that time Cortes remained master of the lake; and the brigantines not only preserved a communication between the Spaniards in their different stations, though at considerable distance from each other, but were employed to cover the causeways on each side, and keep off the canoes, when they attempted to annoy the troops as they advanced towards the city. He formed the brigantines in three divisions, allotting one to each station, with orders to second the operations of the officer who commanded there. From all the three stations he pushed on the attack against the city with equal vigour; but in a manner so very different from that whereby sieges are conducted in regular war, as might appear no less improper than singular to persons unacquainted with his situation. Each morning his troops assaulted the barricades which the enemy had erected on the causeways, forced their way over the trenches which they had dug, and through the canals where the bridges were broken down, and endeavoured to penetrate into the heart of the city, in hopes of obtaining some decisive advantage, which might force the enemy to surrender, and terminate the war at once; but when the obstinate valour of the Mexicans rendered the efforts of the day ineffectual, the Spaniards retired in in the evening to their former quarters. Thus their toil and danger were, in some measure, continually renewed, the Mexicans repairing in the night what the Spaniards had destroyed through the day, and recovering the posts from which they had driven them. But necessity prescribed this slow and untoward mode of operation. The number of his troops was so small, that Cortes durst not, with a handful of men, attempt to make a lodgment in a city where he might be surrounded and annoyed by such a multitude of enemies. The remembrance of what he had already suffered by the ill-judged confidence with which he had ventured into such a dangerous situation, was still fresh in his mind. The Spaniards, exhausted with fatigue, were unable to guard the various posts which they daily gained; and though their camp was filled with Indian auxiliaries, they durst not devolve this charge upon them, because they were so little accustomed to discipline, that no confidence could be placed in their vigilance. Besides this, Cortes was extremely solicitous to preserve the city as much as possible from being destroyed, both as he destined it to be the capital of his conquests, and wished that it might remain as a monument of his glory. From all these considerations, he adhered obstinately, for a month after the siege was opened, to the system which he had adopted. The Mexicans, in their own defence, displayed valour which was hardly inferior to that with which the Spaniards attacked them. On land, on water, by night and by day, one furious conflict succeeded to another. Several Spaniards were killed, more wounded, and all were ready to sink under the toils of unintermitting service, which were rendered more intolerable by the injuries of the season, the periodical rains being now set in with their usual violence.

Astonished and disconcerted with the length and difficulties of the siege, Cortes determined to make one great effort to get possession of the city before he relinquished the plan which he had hitherto followed, and had recourse to any other mode of attack. With this view, he sent instructions to Alvarado and Sandoval to advance with their divisions to a general assault, and took the command in person of that posted on the causeway of Cuyocan. Animated by his presence, and the expectation of some decisive event, the Spaniards pushed forward with irresistible impetuosity. They broke through one barricade after another, forced their way over the ditches and canals, and having entered the city, gained ground incessantly, in spite of the multitude and ferocity of their opponents. Cortes, though delighted with the rapidity of his progress, did not forget that he might still find it necessary to retreat; and in order to secure it, appointed Julian de Alderete, a captain of chief note in the troops which he had received from Hispaniola, to fill up the canals and gaps in the causeway as the main body advanced. That officer deeming it inglorious to be thus employed, while his companions were in the heat of action and the career of victory, neglected the important charge committed to him, and hurried on inconsiderately to mingle with the combatants. The Mexicans, whose military attention and skill were daily improving, no sooner observed this, than they carried an account of it to their monarch.

Guatimozin instantly discerned the consequences of the error which the Spaniards had committed, and, with admirable presence of mind, prepared to take advantage of it. He commanded the troops posted in the front to slacken their efforts, in order to allure the Spaniards to push forward, while he dispatched a large body of chosen warriors through different streets, some by land, and others by water, towards the great breach in the causeway, which had been left open. On a signal which he gave, the priests in the great temple struck the great drum consecrated to the god of war. No sooner did the Mexicans hear its doleful solemn sound, calculated to inspire them with contempt of death and with enthusiastic ardour, than they rushed upon the enemy with frantic rage. The Spaniards, unable to resist men urged on no less by religious fury than hope of success, began to retire, at first leisurely, and with a good countenance; but as the enemy pressed on, and their own impatience to escape increased, the terror and confusion became so general, that when they arrived at the gap in the causeway, Spaniards and Tlascalans, horsemen and infantry, plunged in promiscuously, while the Mexicans rushed upon them fiercely from every side, their light canoes carrying them through shoals which the brigantines could not approach. In vain did Cortes attempt to stop and rally his flying troops; fear rendered them regardless of his intreaties or commands. 131 Cortes repulsed in an attack.
Finding all his endeavours to renew the combat fruitless, his next care was to save some of those who had thrown themselves into the water; but while thus employed, with more attention to their situation than to his own, six Mexican captains suddenly laid hold of him, and were hurrying him off in triumph; and tho' two of his officers rescued him at the expence of their own lives, he received several dangerous wounds before he could break loose. Above 60 Spaniards perished in the rout; and what rendered the disaster more afflicting, 40 of these fell alive into the hands of an enemy never known to shew mercy to a captive.

The approach of night, though it delivered the dejected Spaniards from the attacks of the enemy, ushered in, what was hardly less grievous, the noise of their barbarous triumph, and of the horrid festival with which they celebrated their victory. Every quarter of the city was illuminated; the great temple shone with such peculiar splendor, that the Spaniards could plainly see the people in motion, and the priests busy in hastening the preparations for the death of the prisoners. Through the gloom they fancied that they discerned their companions by the whiteness of their skins, as they were stripped naked and compelled to dance before the image of the god to whom they were to be offered. They heard the shrieks of those who were sacrificed, and thought they could distinguish each unhappy victim by the well-known sound of his voice. Imagination added to what they really saw or heard, and augmented its horror. The most unfeeling melted into tears of compassion, and the stoutest heart trembled at the dreadful spectacle which they beheld.

Cortes, who, besides all that he felt in common with his soldiers, was oppressed with the additional load of anxious reflections natural to a general on such an unexpected calamity, could not like them relieve his mind by giving vent to its anguish. He was obliged to assume an air of tranquillity in order to revive the spirits and

and hopes of his followers. The juncture, indeed, required an extraordinary exertion of fortitude. The Mexicans, elated with their victory, ſallied out next morning to attack him in his quarters. But they did not rely on the efforts of their own arms alone: they ſent the heads of the Spaniards whom they had ſacrificed to the leading men in the adjacent provinces, and aſſured them that the god of war, appeaſed by the blood of their invaders, which had been ſhed ſo plentifully on his altars, had declared with an audible voice, that in eight days time thoſe hated enemies ſhould be finally deſtroyed, and peace and proſperity re-eſtabliſhed in the empire.

132 The Mexicans renew the attack with great fury.

A prediction, uttered with ſuch confidence, and in terms ſo void of ambiguity, gained univerſal credit among a people prone to ſuperſtition. The zeal of the provinces which had already declared againſt the Spaniards augmented, and ſeveral which had hitherto remained inactive took arms with enthuſiaſtic ardour to execute the decrees of the gods. The Indian auxiliaries who had joined Cortes, accuſtomed to venerate the ſame deities with the Mexicans, and to receive the reſponſes of their prieſts with the ſame implicit faith, abandoned the Spaniards as a race of men devoted to certain deſtruction. Even the fidelity of the Tlaſcalans was ſhaken, and the Spaniſh troops were left almoſt alone in their ſtations. Cortes, finding that he attempted in vain to diſpel the ſuperſtitious fears of his confederates by argument, took advantage, from the imprudence of thoſe who had framed the prophecy in fixing its accompliſhment ſo near at hand, to give them a ſtriking demonſtration of its falſity. He ſuſpended all military operations during the period marked out by the oracle. Under cover of the brigantines, which kept the army at a diſtance, his troops lay in ſafety, and the fatal term expired without any diſaſter.

His allies, aſhamed of their own credulity, returned to their ſtation. Other tribes, judging that the gods, who had now deceived the Mexicans, had decreed finally to withdraw their protection from them, joined his ſtandard; and ſuch was the levity of a ſimple people, moved by every ſlight impreſſion, that, in a ſhort time after ſuch a general defection of his confederates, Cortes ſaw himſelf, if we may believe his own account, at the head of 150,000 Indians. Even with ſuch a numerous army, he found it neceſſary to adopt a new and more wary ſyſtem of operation. Inſtead of renewing his attempts to become maſter of the city at once, by ſuch bold but dangerous efforts of valour as he had already tried, he made his advances gradually, and with every poſſible precaution againſt expoſing his men to any calamity ſimilar to that which they ſtill bewailed. As the Spaniards puſhed forward, the Indians regularly repaired the cauſeways behind them. As ſoon as they got poſſeſſion of any part of the town, the houſes were inſtantly levelled with the ground. Day by day, the Mexicans, forced to retire as their enemies gained ground, were hemmed in within more narrow limits. Guatimozin, though unable to ſtop the career of the enemy, continued to defend his capital with obſtinate reſolution, and diſputed every inch of ground. But the Spaniards, having not only varied their mode of attack, but, by order of Cortes, having changed the weapons with which they fought, were again armed with the long Chinantlan ſpears, which they had employed with ſuch ſucceſs againſt Narvaez; and, by the firm array in which this enabled them to range themſelves, they repelled, with little danger, the looſe aſſault of the Mexicans: incredible numbers of them fell in the conflicts, which they renewed every day. While war waſted without, famine began to conſume them within the city. The Spaniſh brigantines, having the entire command of the lake, rendered it impoſſible to receive any ſupply of proviſions by water. The vaſt number of his Indian auxiliaries enabled Cortes to ſhut up the avenues to the city by land. The ſtores which Guatimozin had laid up were exhauſted by the multitudes which crowded into the capital to defend their ſovereign and the temples of their gods. Not only the people, but perſons of the higheſt rank, felt the utmoſt diſtreſſes of want. What they ſuffered brought on infectious and mortal diſtempers, the laſt calamity that viſits beſieged cities, and which filled up the meaſure of their woes.

133 Cortes adopts a more cautious method of proceeding.

But, under the preſſure of ſo many and ſuch various evils, the ſpirit of Guatimozin remained firm and unſubdued. He rejected with ſcorn every overture of peace from Cortes; and, diſdaining the idea of ſubmitting to the oppreſſors of his country, determined not to ſurvive its ruin. The Spaniards continued their progreſs. At length all the three diviſions penetrated into the great ſquare in the centre of the city, and made a ſecure lodgment there. Three-fourths of the city were now reduced, and laid in ruins. The remaining quarter was ſo cloſely preſſed, that it could not long withſtand aſſailants who attacked it from their new ſtation with ſuperior advantage, and more aſſured expectation of ſucceſs. The Mexican nobles, ſolicitous to ſave the life of a monarch whom they revered, prevailed on Guatimozin to retire from a place where reſiſtance was now vain, that he might rouſe the more diſtant provinces of the empire to arms, and maintain there a more ſucceſsful ſtruggle with the public enemy. In order to facilitate the execution of this meaſure, they endeavoured to amuſe Cortes with overtures of ſubmiſſion, that, while his attention was employed in adjuſting the articles of pacification, Guatimozin might eſcape unperceived. But they made this attempt upon a leader of greater ſagacity and diſcernment than to be deceived by their arts. Cortes ſuſpecting their intention, and aware of what moment it was to defeat it, appointed Sandoval, the officer on whoſe vigilance he could moſt perfectly rely, to take the command of the brigantines, with ſtrict injunctions to watch every motion of the enemy. Sandoval, attentive to the charge, obſerving ſome large canoes crowded with people rowing along the lake with extraordinary rapidity, inſtantly gave the ſignal to chace. Gracia Holguin, who commanded the fleeteſt brigantine, ſoon overtook them, and was preparing to fire on the foremoſt canoe, which ſeemed to carry ſome perſon whom all the reſt followed and obeyed. At once the rowers dropt their oars, and all on board, throwing down their arms, conjured him with cries and tears to forbear, as the emperor was there. Holguin eagerly ſeized his prize; and Guatimozin, with a dignified compoſure, gave himſelf up into his hands, requeſting only that no inſult might be offered to the empreſs or his children. When conducted to Cortes, he

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he appeared neither with the ſullen fierceneſs of a barbarian, nor with the dejection of a ſuppliant. "I have done," ſaid he, addreſſing himſelf to the Spaniſh general, "what became a monarch. I have defended my people to the laſt extremity. Nothing now remains but to die. Take this dagger," laying his hand on one which Cortes wore, "plant it in my breaſt, and put an end to a life which can no longer be of uſe."

As ſoon as the fate of their ſovereign was known, the reſiſtance of the Mexicans ceaſed; and Cortes took poſſeſſion of that ſmall part of the capital which yet remained undeſtroyed. Thus terminated the ſiege of Mexico, the moſt memorable event in the conqueſt of America. It continued 75 days, hardly one of which paſſed without ſome extraordinary effort of one party in the attack, or of the other in the defence of a city, on the fate of which both knew that the fortune of the empire depended. As the ſtruggle here was more obſtinate, it was likewiſe more equal, than any between the inhabitants of the Old and New Worlds. The great abilities of Guatimozin, the number of his troops, the peculiar ſituation of his capital, ſo far counterbalanced the ſuperiority of the Spaniards in arms and diſcipline, that they muſt have relinquiſhed the enterpriſe, if they had truſted for ſucceſs to themſelves alone. But Mexico was overturned by the jealouſy of neighbours who dreaded its power, and by the revolt of ſubjects impatient to ſhake off its yoke. By their effectual aid, Cortes was enabled to accompliſh what, without ſuch ſupport, he would hardly have ventured to attempt. How much ſoever this account of the reduction of Mexico may detract, on the one hand, from the marvellous relations of ſome Spaniſh writers, by aſcribing that to ſimple and obvious cauſes which they attribute to the romantic valour of their countrymen, it adds, on the other, to the merit and abilities of Cortes, who, under every diſadvantage, acquired ſuch an aſcendant over unknown nations, as to render them inſtruments towards carrying his ſcheme into execution.

The exultation of the Spaniards, on accompliſhing this arduous enterpriſe, was at firſt exceſſive. But this was quickly damped by the cruel diſappointment of thoſe ſanguine hopes which had animated them amidſt ſo many hardſhips and dangers. Inſtead of the inexhauſtible wealth which they expected from becoming maſters of Montezuma's treaſures, and the ornaments of ſo many temples, their rapaciouſneſs could collect only an inconſiderable booty amidſt ruins and deſolation (A). Guatimozin, aware of his impending fate, had ordered what remained of the riches amaſſed by his anceſtors to be thrown into the lake. The Indian auxiliaries, while the Spaniards were engaged in conflict with the enemy, had carried off the moſt valuable part of the ſpoil. The ſum to be divided among the conquerors was ſo ſmall, that many of them diſdained to accept of the pittance which fell to their ſhare, and all murmured and exclaimed; ſome againſt Cortes and his confidents, whom they ſuſpected of having ſecretly appropriated to their own uſe a large portion of the riches which ſhould have been brought into the common ſtock; others againſt Guatimozin, whom they accuſed of obſtinacy, in refuſing to diſcover the place where he had hidden his treaſure.

Arguments, intreaties, and promiſes, were employed in order to ſoothe them; but with ſo little effect, that Cortes, from ſolicitude to check this growing ſpirit of diſcontent, gave way to a deed which ſtained the glory of all his great actions. Without regarding the former dignity of Guatimozin, or feeling any reverence for thoſe virtues which he had diſplayed, he ſubjected the unhappy monarch, together with his chief favourite, to torture, in order to force from them a diſcovery of the royal treaſures, which it was ſuppoſed they had concealed. Guatimozin bore whatever the refined cruelty of his tormentors could inflict, with the invincible fortitude of an American warrior. His fellow-ſufferer, overcome by the violence of the anguiſh, turned a dejected eye towards his maſter, which ſeemed to implore his permiſſion to reveal all that he knew. But the high-ſpirited prince, darting on him a look of authority mingled with ſcorn, checked his weakneſs, by aſking, "Am I now repoſing on a bed of flowers?" Overawed by the reproach, he perſevered in his dutiful ſilence, and expired. Cortes, aſhamed of a ſcene ſo horrid, reſcued the royal victim from the hands of his torturers, and prolonged a life reſerved for new indignities and ſufferings.

137 Guatimozin tortured.

138 The Spaniards become maſters of the whole Mexican empire.

The fate of the capital, as both parties had foreſeen, decided that of the empire. The provinces ſubmitted one after another to the conquerors. Small detachments of Spaniards marching through them without interruption, penetrated, in different quarters, to the great Southern Ocean, which, according to the ideas of Columbus, they imagined would open a ſhort as well as eaſy paſſage to the Eaſt Indies, and ſecure to the crown of Caſtile all the envied wealth of thoſe fertile regions; and the active mind of Cortes began already to form ſchemes for attempting this important diſcovery. In his after ſchemes, however, he was diſappointed; but Mexico hath ever ſince remained in the hands of the Spaniards.

139 Ancient diviſions of Mexico.

The *ancient* kingdom of Mexico, properly ſo called, was divided into ſeveral provinces, of which the vale of Mexico itſelf was the fineſt in every reſpect. It is ſurrounded by verdant mountains, meaſuring upwards of 120 miles in circumference at their baſe. A great part of this vale is occupied by two lakes, the upper one of freſh water, but the lower one brackiſh, communicating with the former by means of a canal. All the water running from the mountains is collected in this lower lake, on account of its being in the bottom of the valley; hence it was ready, when ſwelled by extraordinary rains, to overflow the city of Mexico, as has already been obſerved. This delightful region contained the three imperial cities of Mexico, Acolhuacan, and Tlacopan; beſides 40 others, with innumerable villages and hamlets; but the moſt conſiderable of theſe, according to Clavigero, now ſcarcely retain one-twentieth part of their former magnificence. The principal inland provinces to the northward were

(A) The gold and ſilver, according to Cortes, amounted only to 120,000 peſos, Relat. 281, A. a ſum far inferior to that which the Spaniards had formerly divided in Mexico.

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the Otomies; to the south-west the Malatzincas and Cuitlatecas; to the south the Tlahuicas and Cohuixcas; to the south-east, after the states of Itzocan, Jauhtepac, Quauhquecollon, Atlixco, Tehuacan, and others, were the great provinces of the Mixtecas, the Zapotecas, and the Chiapanecas; towards the east were the provinces of Tepayacac, the Popolocas, and Totonacas. The maritime provinces on the Mexican Gulf were Coatzacualco and Cuetlachtlan, called by the Spaniards *Cotasta*. On the Pacific Ocean were those of Coliman, Zacatollan, Tototepec, Tecuantepec, and Zoconochco.

The province of the Otomies began in the northern part of the vale of Mexico, extending through the mountains to the north to the distance of 90 miles from the city of Mexico; the principal cities being Tollan or Tula, and Xilotepec: the latter made the capital of the country by the Spaniards. Beyond the settlements of the Otomies, the country for more than a thousand miles in extent was inhabited only by barbarous and wandering savages.

The Malatzinca province contained the valley of Tolocan, and all the country from *Taximaroa* to the frontier of the kingdom of Michuacan. The valley of Tolocan is upwards of 40 miles long from south-east to north-west, and 30 in breadth where broadest. Its principal city, named also *Tolocan*, is situated at the foot of a high mountain covered with snow, 30 miles distant from Mexico.

The country of the Cuitlatecas extended from north-east to south-west, upwards of 200 miles, extending as far as the Pacific Ocean. Their capital was named Mexcaltepec, once a great and populous city, situated upon the sea-coast; but of which the ruins are now scarcely visible. That of the Tlahuicas was named Quauhnahuac, and situated about 40 miles to the southward of Mexico. The province extended almost 60 miles southward, commencing from the southern mountains of the vale of Mexico.

The country of the Cohuixcas extended on the southward as far as the Pacific Ocean, through that part where at present the port and city of Acapulco lie. It was divided into the states of Tzompanco, Chilapan, Tlapan, and Tistla; the latter a very hot and unwholesome country. To this province belonged a place named *Tlachco*, celebrated for its silver-mines.

The province of the Mixtecas extended from *Acatlan*, a place distant about 120 miles from Mexico, as far as the Pacific Ocean towards the south east. The inhabitants carried on a considerable commerce, and had several well inhabited cities and villages. To the east of the Mixtecas were the Zapotecas, so called from their capital Teotzapotlan. In their district was the valley of Huaxyacac, now Oaxaca or Guaxaca.

The province of Mazatlan lay to the northward of the Mixtecas; and to the northward and eastward of the Zapotecas was *Chimantla*, having their capitals of the same name with their provinces. The Chiapanecas, Zoqui, and Queleni, were the last of the Mexican provinces towards the south-east. On the side of the mountain Popocatepec and around it lay several states, of which the most considerable were Cholallan and Huexotzinco. These two having, with the assistance of the Tlascalans, shaken off the Mexican yoke, re-established their former aristocratical government. The Cholulans possessed a small hamlet called Cuitlaxcoapan, in the place where the Spaniards afterwards founded the city of Angelopoli, which is the second of New Spain.

To the eastward of Cholula lay a considerable state named Tepeyacac; and beyond that the Popolocas, whose principal cities were Tecamachalco and Quechollac. To the southward of the Popolocas was the state of Tehuacan, bordering upon the country of the Mixtecas; to the east, the maritime province of Cuetlachtlan; and to the north the Totonacas. The extent of this province was 150 miles, beginning from the frontier of Zacatlan, a state distant about 80 miles from the court, and terminating in the Gulf of Mexico. Besides the capital, named *Mizquihuacan*, this country had the beautiful city of Chempoallan, situated on the coast of the Gulf; remarkable for being that by which the Spaniards entered the Mexican empire.

Coliman was the most northerly of the provinces on the Pacific Ocean; the capital, named also Coliman, being in lat. 19. long. 272 Towards the south-east was the province of Zacotlan, with its capital of the same name; then came the coast of the Cuitlatecas; after it that of the Cohuixcans, in which was the celebrated port of Acapulco. The *Jopi* bordered on the Cohuixca coast; and adjoining to that the Mixteca country, now called *Misteca*; next to that was the large province of Tecuantepec; and lastly, that of Xochonochco.

This province, the most southerly of the Mexican empire, was bounded on the east and south-east by the country of Xochitepec, which did not belong to Mexico; on the west by Tecuantepec; and on the south by the ocean. The capital, called also *Xoconochco*, was situated between two rivers, in 14 degrees of latitude and 283 of longitude. On the Mexican Gulf there were, besides the country of the Totonecas, the provinces of Cuetlachtlan and Coatzacualco; the latter bounded on the east by the states of Tabasco and the peninsula of Yucatan. The province of Cuetlachtlan comprehended all the coast between the rivers Alvarado and Antigua, where the province of the Totonecas began.

14 Climate.

The climate of this vast country varies very much according to the situation of its different parts. The maritime places are hot, unhealthy, and moist; the heat being so great as to cause people sweat even in the month of January. This heat is supposed to be owing to the flatness of the coasts, and the accumulation of sand upon them. The moisture arises from the vast evaporation from the sea, as well as from the great torrents of water descending from the mountains. The lands which lie in the neighbourhood of high mountains, the tops of which are always covered with snow, must of necessity be cold; and Clavigero informs us, that he has been on a mountain not more than 25 miles distant from the city of Mexico, where there was white frost and ice even in the dog-days. "All the other inland countries (says our author), where the greatest population prevailed, enjoy a climate so mild and benign, that they neither feel the rigour of winter nor the heats of summer. It is true, in many of these countries, there is frequently white frost in in the three months of December, January, and February, and sometimes even it snows; but the small inconvenience which such cold occasions continues only till the rising sun: no other fire than his rays is necessary to give warmth in winter; no other relief is wanted in the season of heat but the shade: the same clothing which covers men in the dog-days defends them in January, and the animals sleep all the year under the open sky.

"This mildness and agreeableness of climate under the torrid zone is the effect of several natural causes entirely unknown to the ancients, who did not believe it to be inhabited; and not well understood by some moderns, by whom it is believed unfavourable to those who live in it. The purity of the atmosphere, the smaller obliquity of the solar rays, and the longer stay of this luminary above the horizon in winter, in comparison of other regions farther removed from the equator, concur to lessen the cold, and to prevent all that horror which disfigures the face of nature in other climes. During that season a serene sky and the natural delights of the country are enjoyed; whereas, under the frigid, and even for the most part under the temperate zones, the clouds rob man of the prospect of heaven, and the snow buries the beautiful productions of the earth. No less causes combine to temper the heat of summer. The plentiful showers which frequently water the earth after mid-day from April or May to September or October; the high mountains, continually loaded with snow, scattered here and there through the country of Anahuac; the cool winds which breathe from them in that season; and the shorter stay of the sun above the horizon, compared with the circumstances of the temperate zone, transform the climes of those happy countries into a cool and cheerful spring. But the agreeableness of the climate is counterbalanced by thunder-storms, which are frequent in summer, particularly in the neighbourhood of the mountain of Tlascala; and by earthquakes, which are at all times felt, though with less danger than terror. Storms of hail are neither more frequent nor more severe than in Europe."

One undoubted inconvenience which Mexico has is that of volcanoes, of which our author enumerates five. One named by the Spaniards *Volcan d'Orizaba* is higher than the peak of Teneriffe, according to the account of the Jesuit Tallandier, who measured them both. It began to send forth smoke in the year 1545, and continued burning for 20 years, but has not discovered any symptoms of eruption since that time. It is of a conical figure; and, by reason of its great height, may be seen at 50 leagues distance. The top is always covered with snow, but the lower part with woods of pine and other valuable timber. It is about 90 miles to the eastward of the capital.

Two other mountains, named *Popocatepec* and *Iztaccihuatl*, which lie near each other, at the distance of 33 miles to the south-east of Mexico, are likewise surprisingly high. Clavigero supposes the former to be higher than the highest of the Alps, considering the elevated ground on which the base of it stands. It has a crater more than half a mile wide; from which, in the time of the Mexican kings, great quantities of smoke and flame issued. In the last century it frequently threw out great showers of ashes upon the adjacent places; but in this century hardly any smoke has been observed. This mountain is named by the Spaniards *Volcan*, and the other *Sierra Nevada*. The latter has also sometimes emitted flames. Both of them have their tops always covered with snow in such quantities, that the masses which fall down upon the neighbouring rocks supply the cities of Mexico, Gelopoli, Cholula, and all the adjacent country to the distance of 40 miles, with that commodity; of which the consumpt is so great, that in 1746 the impost upon what was consumed in the city of Mexico amounted to 15,212 Mexican crowns; some years after it amounted to 20,000; and is now in all probability a great deal more. Besides these, there are the two mountains of Coliman and Tochtlan, both of which have occasionally emitted flames. Our author does not include in the list of Mexican volcanoes either those of Nicaragua or Guatimala; because these countries were not subject to the Mexican sovereigns. Those of Guatimala sometimes break forth in a most furious manner, and in the year 1773 entirely destroyed that beautiful city. The Nicaraguan volcano called *Juruyo* was only a small hill before the year 1760. In that year, however, on the 29th of September, it began to burn with furious explosions, ruining entirely the sugar-work and the neighbouring village of *Guacana*; and from that time continued to emit fire and burning rocks in such quantities, that the erupted matters in six years had formed themselves into three high mountains nearly six miles in circumference. During the time of the first eruption, the ashes were carried as far as the city of Queretaro, 150 miles distant from the volcano; and at Valladolid, distant 60 miles from it, the shower was so abundant, that the people were obliged to sweep the house-yards two or three times a-day.

Besides these volcanoes, there are others in Mexico of a very remarkable height. The great chain of mountains called the *Andes* are continued through the isthmus of Panama and through all Mexico, until they are lost in the unknown mountains of the north. The most considerable of that chain is known in Mexico by the name of *Sierra Madre*, particularly in Cinaloa and Tarahumara, provinces no less than 1200 miles distant from the capital.

143 Rivers and lakes.

Mexico is well watered by very considerable rivers, though none of them are comparable to those of South America. Some of these run into the gulf of Mexico, and others into the Pacific Ocean. The Alvarado has its principal source among the mountains of the Zapotecas, and discharges itself by three navigable mouths into the Mexican gulf, at the distance of 30 miles from Vera Cruz. The Coatzocualco rises among the mountains of the Mixtecas, and empties itself into the gulf near the country of Onohualco. The river Chiapan, which likewise runs into this gulf, rises among the mountains which separate the district of Chiapan from that of Guatimala. The Spaniards call this river *Tabasco*; by which name they also called that tract of land which unites Yucatan to the Mexican continent. It was also called the *Grijalva*, from the name of the commander of the first Spanish fleet who discovered it.

The most celebrated of the rivers which run into the Pacific Ocean is that called by the Spaniards

Gua-

Mexico. *Guadalaxara* or *Great River.* It riſes in the mountains of Toloccan; and after running a courſe of more than 600 miles, diſcharges itſelf into the ocean in 22° latitude.

There are likewiſe in this country ſeveral lakes of very conſiderable magnitude; but thoſe of Nicaragua, Chapallan, and Pazquaro, which are of the greateſt extent, did not belong to the ancient Mexican empire. The moſt remarkable were thoſe in the vale of Mexico, upon which the capital of the empire was founded. Of theſe, the freſh water one called the *lake of Chalco*, extended in length from eaſt to weſt 12 miles, as far as the city of Xochimilco; from thence, taking a northerly direction, it incorporated itſelf by means of a canal with the lake of Tezcuco; but its breadth did not exceed ſix miles. The other, named the *lake of Tezcuco*, extended 15, or rather 17, miles from eaſt to weſt, and ſomething more from ſouth to north; but its extent is now much leſs, by reaſon of the Spaniards having diverted the courſe of many of the ſtreams which run into it. This lake is ſalt, which Clavigero ſuppoſes to ariſe from the nature of the ſoil which forms its bed.

Beſides theſe, there are a number of ſmaller lakes, ſome of which are very delightful. There is a vaſt variety of mineral waters, of the nitrous, ſulphureous, and aluminous kinds, ſome of them ſo hot that meat might be boiled in them. At Tecuhuacan is a kind of petreſying water, as well as in ſeveral other parts of the empire. One of them forms a kind of ſmooth white ſtones, not diſpleaſing to the taſte; the ſcrapings of which taken in broth are celebrated as a diaphoretic, probably without any good reaſon. The doſe for a perſon not difficult to be ſweated is one drachm of the ſcrapings. Many of the rivers of Mexico afford ſurpriſing and beautiful caſcades; particularly the great river Guadalaxara, at a place called *Tempizque*, 15 miles to the ſouthward of that city. Along a deep river called *Atoyaque* is a natural bridge, conſiſting of a vaſt mound of earth, along which carriages paſs conveniently. Clavigero ſuppoſes it to have been the fragment of a mountain thrown down by an earthquake, and then penetrated by the river.

144 Metals and minerals. The mineral productions of Mexico are very valuable. The natives found gold in ſeveral provinces of the empire. They gathered it principally from among the ſands of their rivers in grains; and the people in whoſe country it was found, were obliged to pay a certain quantity by way of tribute to the emperor. They dug ſilver out of mines in Tlochco, and ſome other countries, but it was leſs prized by them than by other nations. Since the conqueſt, however, ſo many ſilver mines have been diſcovered in that country, eſpecially in the provinces to the northweſt of the capital, that it is in vain to attempt any enumeration of them. They had two ſorts of copper: one hard, which ſerved them inſtead of iron, to make axes and other inſtruments for war and agriculture; the other kind, which was ſoft and flexible, ſerved for domeſtic utenſils as with us. They had alſo tin from the mines of Tlachco, and dug lead out of mines in the country of the Otomies; but we are not informed what uſes they put this laſt metal to. They had likewiſe mines of iron in Tlaſcala, Tlachco, and ſome other places; but theſe were either unknown to the Mexicans, or they did not know how to benefit themſelves by them. In Chilapan were mines of quickſilver; and in many places they had ſulphur, alum, vitriol, cinnabar, ochre, and an earth greatly reſembling white lead. Theſe minerals were employed in painting and dyeing; but we know not to what uſe they put their quickſilver. There was great abundance of amber and aſphaltum upon their coaſts; both of which were paid in tribute to the king of Mexico from many parts of the empire. The former was wont to be ſet in gold by way of ornament, and aſphaltum was employed in their ſacrifices.

145 Precious ſtones. Mexico produces ſome diamonds, though but few in number; but they had in greater plenty ſome other precious ſtones, ſuch as amethyſts, cats-eyes, turquoiſes, cornelians, and ſome green ſtones reſembling emeralds, and very little inferior to them; of all which a tribute was paid to the emperor by the people in whoſe territories they were found. They were likewiſe furniſhed with cryſtal in plenty from the mountains which lay on the coaſt of the Mexican gulph, between the port of Vera Cruz and the river Coatzacualco. In the mountains of Celpolalpan, to the eaſtward of Mexico, were quarries of jaſper and marble of different colours: they had likewiſe alabaſter at a place called *Tecalco*, now *Tecale*, in the neighbourhood of the province of Tapeyacac and many other parts of the empire. The ſtone tetzontli is generally of a dark red colour, pretty hard, porous, and light, and unites moſt firmly with lime and ſand; on which account it is of great requeſt for buildings in the capital, where the foundation is bad. There are entire mountains of loadſtone, a very conſiderable one of which lies between Teoitztlan and Chilapan, in the country of the Cohuixcas. They formed curious figures of nephritic ſtone, ſome of which are ſtill preſerved in European muſeums. They had a kind of fine white talc which burnt into an excellent plaſter, and with which they uſed to whiten their paintings. But the moſt uſeful ſtone they had was that called *itztli*, of which there is great abundance in many parts of Mexico. It has a gloſſy appearance, is generally of a black colour, and ſemitranſparent; though ſometimes alſo of a blue or white colour. In South America this ſtone is called *pietra del galinazzo*: and Count Caylus endeavours to ſhow, in a manuſcript diſſertation quoted by Bomare, that the *obſidiana*, of which the ancients made their *vaſes murini*, were entirely ſimilar to this ſtone. The Mexicans made of it looking-glaſſes, knives, lancets, razors, and ſpears. Sacred vaſes alſo were made of it after the introduction of Chriſtianity.

146 Vegetable production. The ſoil of Mexico, though various, produced every where the neceſſaries and even the luxuries of life. "The celebrated Dr Hernandez, the Pliny of New Spain (ſays Clavigero), has deſcribed in his Natural Hiſtory about 1200 plants natives of the country; but his deſcription, though large, being confined to medicinal plants, has only compriſed one part of what provident nature has produced there for the benefit of mortals. With regard to the other claſſes of vegetables, ſome are eſteemed for their flowers, ſome for their fruit, ſome for their leaves, ſome for their root, ſome for their trunk or their wood; and others for their gum, reſin, oil, or juice."

Mexico.

Mexico abounds with a great variety of flowers, many of which are peculiar to the country, while multitudes of others imported from Europe and Aſia rival in luxuriance the natives of the country itſelf. The fruits are partly natives of the Canary iſlands, partly of Spain, beſides thoſe which grow naturally in the country. The exotics are water-melons, apples, pears, peaches, quinces, apricots, pomegranates, figs, black cherries, walnuts, almonds, olives, cheſnuts, and grapes; though theſe laſt are likewiſe natives. There are two kinds of wild vine found in the country of the Mixtecas; the one reſembling the common vine in the ſhoots and figure of its leaves. It produces large red grapes covered with an hard ſkin, but of ſweet and grateful taſte, which would undoubtedly improve greatly by culture. The grape of the other kind is hard, large, and of a very harſh taſte, but they make an excellent conſerve of it. Our author is of opinion that the cocoa tree, plantain, citron, orange, and lemon, came from the Philippine iſlands and Canaries; but it is certain that theſe, as well as other trees, thrive in this country as well as in their native ſoil. All the maritime countries abound with cocoa-nut trees; they have ſeven kinds of oranges and four of lemons, and there are likewiſe four kinds of plantains. The largeſt, called the *zapalot*, is from 15 to 20 inches long, and about three in diameter; it is hard, little eſteemed, and only eat when roaſted or boiled. The *platano largo*, or "long plantain," is about eight inches long and one and a half in diameter; the ſkin is at firſt green, and blackiſh when perfectly ripe. The *guineo* is a ſmaller fruit, but richer, ſofter, and more delicious, though not ſo wholeſome. A ſpecies of plantain, called the *dominico*, is ſmaller and more delicate than the others. There are whole woods of plantain trees, oranges, and lemons; and the people of Michuacan carry on a conſiderable commerce with the dried plantains, which are preferable either to raiſins or figs. Clavigero enumerates 28 different ſorts of fruit natives of Mexico, beſides many others, the names of which are not mentioned. Hernandez mentions four kinds of cocoa nuts; of which the ſmalleſt of the whole was in moſt uſe for chocolate and other drinks daily made uſe of; the other kinds ſerved rather for money in commerce than for aliment. The cocoa was one of the plants moſt cultivated in the warm countries of the empire; and many provinces paid it in tribute to the emperor, particularly that of Xoconocho, the cocoa nut of which is preferable to the others. Cotton was one of the moſt valuable productions of the country, as it ſerved inſtead of flax; though this laſt alſo was produced in the country. It is of two kinds, white and tawny-coloured. They made uſe of *rocou* or Braſil-wood in their dying, as the Europeans alſo do. They made cordage of the bark, and the wood was made uſe of to produce fire by friction.

The principal grain of Mexico, before the introduction of thoſe from Europe, was maize, in the Mexican language called *tlaolli*; of which there were ſeveral kinds, differing in ſize, weight, colour, and taſte. This kind of grain was brought from America to Spain, and from Spain to the other countries of Europe. The French bean was the principal kind of pulſe in uſe among them, of which there were more ſpecies than of the maize. The largeſt was called *ayacotli*, of the ſize of a common bean, with a beautiful red flower; but the moſt eſteemed was the ſmall, black, heavy, French bean. This kind of pulſe, which is not good in Italy, is in Mexico ſo excellent, that it not only ſerves for ſuſtenance to the poorer claſs of people, but is eſteemed a luxury even by the Spaniſh nobility.

149 Eſculent roots.

Of the eſculent roots of Mexico, the following were the moſt remarkable. 1. The *xicama*, called by the Mexicans *catzotl*, was of the figure and ſize of an onion; ſolid, freſh, juicy, and of a white colour; it was always eat raw. 2. The *camote*, is another very common in the country, of which there are three ſorts, white, yellow, and purple: they eat beſt when boiled. 3. The *cacomite*, is the root of a plant which has a beautiful flower called the *tyger-flower*, with three red pointed petals, the middle part mixed with white and yellow, ſomewhat reſembling the ſpots of the creature whence it takes its name. 4. The *huacamote*, is the root of a kind of Caſſava plant, and is likewiſe boiled. 5. The *papa*, a root tranſplanted into Europe, and greatly valued in Ireland, was brought from South America into Mexico. Beſides all which they have a number of kitchen vegetables imported from the Canaries, Spain, and other countries of Europe. The American aloe is very ſimilar to the real one, and is a plant of which the Mexicans formerly, and the Spaniards ſtill, make great uſe.

150 Trees.

They have a variety of palm trees. From the fibres of the leaves of one ſpecies they make thread. The bark of another kind, to the depth of three fingers, is a maſs of membranes, of which the poor people make mats. The leaves of another kind are uſed for ornaments in their feſtivals. They are round, groſs, white, and ſhining; having the appearance of ſhells heaped upon one another. A fourth kind bears nuts called *cocoas*, or nuts of oil. Theſe nuts are of the ſize of a nutmeg, having in the inſide a white, oily, eatable kernel, covered by a thin, purple, pellicle. The oil has a ſweet ſcent, but is eaſily condenſed, when it becomes a ſoft maſs, as white as ſnow.

Of timber trees there are great variety, of a quality not inferior to any in the world; and as there are a variety of climates in the country, every one produces a kind of wood peculiar to itſelf. There are whole woods of cedars and ebonies, vaſt quantities of agallochum or wood of aloes; beſides others valuable on account of their weight, durability, and hardneſs; or for their being eaſily cut, pliable, of a fine colour, or an agreeable flavour. There are alſo in Mexico innumerable trees remarkable for their ſize. Acoſta mentions a cedar, the trunk of which was 16 fathoms in circumference; and Clavigero mentions one of the length of 107 Paris feet. In the city of Mexico he mentions very large tables of cedar made out of ſingle planks. In the valley of Atlixco is a very ancient fir tree, hollowed by lightning; the cavity of which could conveniently hold fourteen horſemen; nay, we are informed by the archbiſhop of Toledo, that, in 1770, he went to view it along with the archbiſhop of Guatimala, at which time he cauſed an hundred young lads enter its cavity. Our author mentions ſome other trees, of the ſpecies called *cedars*, which for magnitude may be compared with this ce-

lebrated

Mexico. lebrated fir. "The largeneſs of theſe trees (ſays he) is proportioned to their prodigious elevation; and they afford a moſt delightful proſpect at the time they are adorned with new leaves and loaded with fruit, in which there is incloſed a particular ſpecies of fine, white, and moſt delicate cotton. This might be, and actually has been, made into webs as ſoft, delicate, and perhaps more ſo than ſilk; but it is toilſome to ſpin, on account of the ſmallneſs of the threads, and the profit does not requite the labour, the web not being laſting. Some uſe it for pillows and matraſſes, which have the ſingular property of expanding enormouſly when expoſed to the heat of the ſun. De Bomare ſays, that the Africans make of the thread of the ceiba that vegetable taffety which is ſo ſcarce, and ſo much eſteemed in Europe. The ſcarcity of ſuch cloth is not to be wondered at conſidering the difficulty of making it. The ceiba, according to this author, is higher than all other trees yet known."

Clavigero mentions a Mexican tree, the wood of which is very valuable, but poiſonous, and if incautiouſly handled, when freſh cut, produces a ſwelling in the ſcrotum. Our author has forgot the name given to it by the Mexicans; nor has he ever ſeen the tree itſelf, nor been witneſs to the effect.

151 Medicinal and aromatic gums.

This country abounds alſo with aromatic and medicinal trees, producing gums, reſins, &c. From one of theſe a balſam is produced not in the leaſt inferior to the celebrated balſam of Mecca. It is of a reddiſh black or yellowiſh white, of a ſharp bitter taſte, and of a ſtrong but moſt grateful odour. It is common in the provinces of Panuco and Chiapan, and other warm countries. The kings of Mexico cauſed it to be tranſplanted into their celebrated garden of Huaxtepec, where it flouriſhed, and was afterwards multiplied in all the neighbouring mountains. The Indians, in order to procure a greater quantity of this balſam, burn the branches, which affords more than mere diſtillation, though undoubtedly of an inferior quality; nor do they regard the loſs of the trees, which are very abundant. The ancient Mexicans were wont to extract it alſo by decoction. The firſt parcel of this balſam brought from Mexico to Rome was ſold at one hundred ducats per ounce; and was, by the apoſtolic ſee, declared to be matter fit for chriſm; though different from that of Mecca, as Acoſta and all other writers on this ſubject obſerve. An oil is likewiſe drawn from the fruit of this tree, ſimilar in taſte and ſmell to that of the bitter almond, but more acrimonious. From two other trees named the *huaconex* and *maripenda*, an oil was extracted equivalent to the balſam. The former is a tree of a moderate height; the wood of which is aromatic, and ſo hard, that it will keep freſh for ſeveral years, though buried under the earth. The leaves are ſmall and yellow; the flowers likewiſe ſmall and white, and the fruit ſimilar to that of the laurel. The oil was diſtilled from the bark of the tree, after breaking it, and keeping it three days in ſpring-water, and then drying it in the ſun. The leaves likewiſe afforded an agreeable oil by diſtillation. The Maripenda is a ſhrub with lanceolated leaves, the fruit of a red colour when ripe, and reſembling the grape. The oil is extracted by boiling the branches with a mixture of ſome of the fruit.

The tree producing liquid amber, the liquid ſtorax of the Mexicans, is of a large ſize, the leaves ſimilar to thoſe of the maple, indented, white in one part and dark in the other, diſpoſed of in threes; the fruit is thorny and round, but polygonous, with the ſurface and the angles yellow; the bark of the tree partly green and partly tawny. By inciſions in the trunk they extract that valuable ſubſtance named *liquid amber*, and the oil of the ſame name, which is ſtill more valuable. Liquid amber is likewiſe obtained from a decoction of the branches, but it is inferior to that obtained from the trunk.

The name *copalli* in Mexico is generic, and common to all the reſins; but eſpecially ſignifies thoſe made uſe of for incenſe. There are ten ſpecies of theſe trees yielding reſins of this kind; the principal of which is that from which the COPAL is got, ſo well known in medicine and varniſhes. A great quantity of this was made uſe of by the ancient Mexicans, and is ſtill uſed for ſimilar purpoſes by the Spaniards. The *tecopalli* or *tepecopalli* is a reſin ſimilar to the incenſe of Arabia; which diſtils from a tree of moderate ſize that grows in the mountains, having a fruit like an acorn, and containing the nut inveloped in a mucilage, within which there is a ſmall kernel uſeful in medicine.

The *mizquitl*, or mezquite, is a ſpecies of true acacia, and the gum diſtilling from it is ſaid to be the true gum arabic. It is a thorny ſhrub, with branches irregularly diſpoſed, the leaves ſmall, thin, and pinnated; the flowers being like thoſe of the birch-tree.—The fruits are ſweet and eatable, containing a ſeed, of which the barbarous Chichemecas were wont to make a kind of paſte that ſerved them for bread. The wood is exceedingly hard and heavy, and the trees are as common in Mexico as oaks are in Europe, particularly on hills in the temperate countries.

Of the elaſtic gum, which is found in plenty in Mexico, the natives were in uſe to make foot-balls, which, though heavy, have a better ſpring than thoſe filled with air. At preſent they varniſh with it their hats, cloaks, boots, and great coats, in a manner ſimilar to what is done in Europe with wax; and by which means they are rendered all water-proof.

152 Mexican animals.

Our author laments that the natural hiſtory of vegetables in Mexico is very little known, and that of animals no better. The firſt Spaniards (ſays he) who gave them names, were more ſkilful in the art of war than in the ſtudy of nature. Inſtead of retaining the terms which would have been moſt proper, they denominated many animals tygers, wolves, bears, dogs, ſquirrels, &c. although they were very different in kind, merely from ſome reſemblance in the colour of their ſkin, their figure, or ſome ſimilarity in habits and diſpoſition. The quadrupeds found in Mexico at the arrival of the Spaniards, were lions, tygers, wild cats, bears, wolves, foxes, the common ſtags, white ſtags, bucks, wild goats, badgers, pole-cats, weaſles, martins, ſquirrels, polatucas, rabbits, hares, otters, and rats. All theſe animals are ſuppoſed by our author to be common to both continents. The white ſtag, whether it be the ſame ſpecies of the other or not, is undoubtedly common to both, and was known to the Greeks and Romans. The Mexicans call it the *king of the ſtags*. M. Buffon imagines the white

Mexico. white colour of this creature to be the effect of captivity; but Clavigero says, that it is found wild, and of the same white colour, on the mountains of New Spain. In many other points, he also controverts the opinions of this celebrated naturalist, who will not allow the lion, tyger, or rabbit, to be natives of America. "The *miztli* of the Mexicans (says he) is no other than the lion without hair mentioned by Pliny, and totally distinct from the African lion; and the *ocelotl* is no way different from the African tyger, according to the testimony of Hernandez, who knew both the one and the other. The *tochtli* of Mexico is exactly the rabbit of the old continent; and at least as ancient as the Mexican calendar, in which the figure of the rabbit was the first symbolical character of their years. The wild cats, in size much larger than the domestic cats, are fierce and dangerous; the bears are all black, and more corpulent than those which are brought from the Alps into Italy. The hares are distinguished from those of Europe by their longer ears, and the wolves by a grosser head. According to M. Buffon, the Mexicans give the name of *polutaca* to the quimicpaltan, or flying rat of the Mexicans. We call it rat, because it resembles a rat in the head, though it is much larger, and flying; because in its natural state, the skin of its sides is loose and wrinkled, which it distends and expands together with its feet like wings, when it makes any considerable leap from one tree to another. This is confounded with the common squirrel on account of their likeness, but they are undoubtedly different. Mice were brought to Mexico in European ships; the rats were not so, but known in the country by the name of *quimichin*, a word metaphorically applied to spies."

Our author now proceeds to enumerate the quadrupeds common to New Spain with the rest of the continent of America. Among these he will not allow a place to the Peruvian sheep, the *huanaco*, and sloth; all of which are peculiar to South America Hernandez indeed makes mention of the Peruvian sheep, and gives a drawing of it; but this was only on account of a few individuals brought thence from Peru, which the Mexicans called by that name, in the same manner as he describes several animals of the Philippine isles; not that they had ever been bred in Mexico, or found in any country of North America, unless it was some individual carried there, as they are carried as a curiosity from Europe. The animals which he allows to be common to both countries are, the Mexican hog, the moufete, the opossum, the armadillo, the *techichi*, a small animal resembling a dog; which being perfectly dumb, gave occasion to a report that the Mexican dogs could not bark. The flesh of this animal was eat by them, and was esteemed agreeable and nourishing food. After the conquest of Mexico, the Spaniards having neither large cattle nor sheep, provided their markets with this quadruped; by which means, the species soon came to be extinct, though it had been very numerous. The land-squirrel is very numerous in the kingdom of Michuacan, has great elegance of form, and is extremely graceful in its movement; but it cannot be tamed, and bites most furiously every person who approaches it.

Besides these, there are sea-lions, rattoons, and that voracious animal named the *tapir*. Oviedo informs us, that he has seen it at one bite tear off two or three hand-breadths of skin from a hound, and at another a whole leg and thigh. The flesh is eatable, and its skin is valued on account of its being sufficiently strong to resist musket-balls. There are likewise great numbers of monkeys of many different kinds; some of which have heads resembling those of dogs. Some of them are strong and fierce, equalling a man in stature when they stand upright.

153 Description of some animals peculiar to Mexico.

Among the animals peculiar to Mexico, is one named by our author *coyoto*, which appears to have been inaccurately described by other natural historians; some making it one species and some another. He says it has the voracity of a wolf, the cunning of a fox, the form of a dog, and in some properties resembles the *adive* and *chacal*. It is about the size of a mastiff, but more slender. The eyes are yellow and sparkling, ears small, pointed, and erect; the snout blackish, strong limbs, and the feet armed with large crooked nails. The tail is thick and hairy, the skin a mixture of black, brown, and white; and the voice is compounded of the howl of the wolf and the bark of the dog. It is one of the most common quadrupeds in Mexico, and most destructive to the flocks. When it invades a sheep-fold, if it cannot find a lamb to carry off, it seizes a sheep by the neck with its teeth, and coupling with it, and beating it on the rump with its tail, conducts it whether it pleases. It pursues the deer, and will sometimes even attack men. Its usual pace is a trot, but so quick that a horse at the gallop can scarce overtake it. The *tlalcojotl* or *tlalcoyoto* is about the size of a middling dog, and in our author's opinion is the largest animal that lives under the earth. Its head has some resemblance to that of a cat; but in colour and length of hair it resembles the lion.—It has a long thick tail, and feeds upon poultry and small animals, which it catches in the night-time. The *tepeizuintli*, or mountain-dog, though it is but of the size of a small dog, is so bold that it attacks deer, and sometimes kills them. Its hair and tail are long, the body black, but the head, neck, and breast, white. Mr Buffon reckons this animal the same with the glutton, but Clavigero denies it. Another animal, larger than the two foregoing, is called the *xoloitzcuintli*. Some of these are no less than four feet in length. It has a face like the dog, but tusks like the wolf, with erect ears, the neck gross, and the tail long.—It is entirely destitute of hair, excepting only the snout, where there are some thick crooked bristles. The whole body is covered with a smooth, soft, ash-coloured skin, spotted partly with black and tawney. This species of animals, as well as the two former, are almost totally extinct. A Lyncean academician named *Giovanni Fabri*, has endeavoured to prove that the xoloitzcuintli is the same with the wolf of Mexico; but this is denied by our author.

An animal called *ocotochtli*, a kind of wild cat, is remarkable more for the fabulous account of it than for any singular property with which it is really endowed. According to Dr Hernandez, when this creature takes any prey, it covers it with leaves, and afterwards mounting on some neighbouring tree, it begins howling to invite other animals to eat its prey; being itself always the last to eat; because the poison of

Mexico.

of its tongue is ſo ſtrong, that if it eat firſt, the prey would be infected, and other animals which eat of it would die.

(153) Curious kind of mole.

A curious animal of the mole kind is called *tozan* or *tuza*. It is about the ſize of an European mole, but very different otherwiſe. The body is about ſeven or eight inches long, and well made; the ſnout like that of a mouſe, the ears ſmall and round, with the tail ſhort. The mouth is armed with very ſtrong teeth, and its paws are furniſhed with ſtrong crooked nails, with which it digs its habitation in the earth. It is extremely deſtructive to the corn fields by the quantity of grain it ſteals, and to the highways by the number of holes it makes in them; for when, on account of the dimneſs of its ſight, it cannot find its firſt hole, it makes another, and ſo on. It digs the earth with its claws and two canine teeth which it has in the upper jaw. In digging, it puts the earth into two membranes like purſes, which are under its ear, and which are furniſhed with muſcles neceſſary for contraction and diſtenſion. When the membranes are full, it empties them by ſtriking the bottom with its paws, and then digs again as before. Theſe creatures are very numerous; but our author does not remember to have ſeen them in the place where land-ſquirrels inhabit.

154 Mexican birds.

The birds are ſo numerous, and of ſuch various appearances and qualities, that Mexico has been called the country of birds as Africa is of quadrupeds. Though Hernandez paſſes over a great number of ſpecies, he yet deſcribes above 200 peculiar to the country. He allows to the eagles and hawks of Mexico a ſuperiority over thoſe of Europe; and the falcons of this country were formerly eſteemed ſo excellent, that, by the deſire of Philip II. an hundred of them were ſent every year over to Spain. The largeſt, the moſt beautiful, and the moſt valuable kind of eagles, is called by the Mexicans *itzquauhtli*, and will purſue not only the larger kind of birds, but quadrupeds, and even men.

The ravens of Mexico do not, like thoſe of other countries, feed upon carrion, but ſubſiſt entirely by ſtealing corn. The carrion is devoured by the birds called in South America *gallinazzi*, in Mexico *zopilots* and *oure*. By Hernandez they are ſaid to be a ſpecies of ravens; but, according to Clavigero, they are very different, not only in their ſize, but in the ſhape of their head, their flight, and their voice.—They fly ſo high, that though pretty large, they are loſt to the ſight: before a hail-ſtorm they may be ſeen wheeling in great numbers in the air, until they entirely diſappear. They diſcover carrion by the acuteneſs of their ſight and ſmell at a great height in the air, and deſcend upon it in a ſpiral flight. They are extremely numerous, and are very uſeful to the country, becauſe they not only clear the fields of carrion, but attend the crocodiles, and deſtroy the eggs of theſe terrible animals. There is another bird, called by the Mexicans the *king of the zopilots*, on account, as it is ſaid, that the true zopilot will not touch a bit of carrion till the other has firſt taſted it.

The aquatic birds are very numerous, and of great variety.—There are at leaſt 20 ſpecies of ducks, a vaſt number of geeſe, with ſeveral kinds of herons, great numbers of ſwans, quails, water-rails, divers, king's fiſhers, pelicans, &c. The multitude of ducks is ſometimes ſo great, that they cover the fields, and appear at a diſtance like flocks of ſheep. Some of the herons and egrets are perfectly white, ſome aſh-coloured; others have the plumage of the body white, while the neck, with the tops and upper part of the wings, and part of the tail, are enlivened with a bright ſcarlet, or beautiful blue. Clavigero mentions a ſingular quality of the pelican, in which it differs from all other birds hitherto known, viz. that it aſſiſts ſuch of its own ſpecies as are hurt or ſick. Of this diſpoſition the Americans ſometimes take the advantage to procure fiſh without any trouble. They take a live pelican and break its wing, and, after tying it to a tree, conceal themſelves in the neighbourhood: there they watch the coming of the other pelicans with their proviſions; and as ſoon as they ſee them throw up the fiſh from the pouch they have below their bill, they run in, and leaving a little for the captive bird carry off all the reſt. The *yoalquachilli* is a ſmall aquatic bird, with a long narrow neck, ſmall head, long yellow bill, long legs, feet, and claws, and a ſhort tail. It is remarkable for the weapons with which it is naturally provided. On the head is a little circle or coronet, of a horny ſubſtance, which is divided into three very ſharp points, and there are two others on the fore-part of the wings.

15[5] Singu[lar] prope[rty] o[f] the pe[lican].

Numbers of the other claſſes of birds are valuable for their fleſh, plumage, or ſong, while ſome are remarkable for their extraordinary inſtinct or other properties. Our author enumerates more than 70 ſpecies of thoſe which afford an agreeable and wholeſome food. Beſides the common fowls which were brought from the Canaries to the Antilles, and from theſe to Mexico, there were, and ſtill are, fowls peculiar to the country itſelf. Theſe partly reſemble the common fowl and partly the peacock, whence they had the name of *gallipavos* from the Spaniards. From Mexico they were imported into Europe, where they have multiplied very faſt, eſpecially in Italy, though the common fowls have multiplied much more in Mexico. There are three kinds of pheaſants; one of which is as large as a gooſe, and very docile. It will become ſo tame as to pick food from its maſter's hand, and run to meet him with ſigns of joy when he comes home, ſhut the door with its bill, &c. By keeping in a yard along with other poultry, it learns to fight like a cock, raiſing the feathers of its creſt, as cocks do thoſe of their neck.

There are great numbers of birds valuable on account of their plumage, which was made uſe of by the Mexicans in their excellent moſaic works; an art which ſeems now to be totally loſt. Peacocks have been carried from the old continent to Mexico; but, not being attended to, have propagated very ſlowly. The birds remarkable for their ſong are likewiſe very numerous; among which that called the *centzontl*, by Europeans the *mocking-bird*, is the moſt remarkable, on account of its counterfeiting naturally the notes of all others it hears. It has been attempted to bring it to Europe, but without ſucceſs. The cardinals are very remarkable, not only on account of their fine colours, but likewiſe of their notes; and even the ſparrows have a moſt delightful and various ſong.

There are great numbers of beautiful parrots; and there is a bird which counterfeits the human voice, but in a kind of burleſque tone, and will follow travellers a great way. The *tzacua* is remarkable for its inſtinct. Birds of this kind live in ſociety, every tree being a village or city to them, having great numbers of neſts in the neighbourhood of each other, all hanging from the boughs. One of them, whoſe office it is to be the head or guard of the village, reſides in the middle of the tree; from which it flies about from one neſt to another, viſiting them all, and after ſinging a little, returns to its place, while the reſt continue perfectly ſilent. If any bird of a different ſpecies approaches the tree, he flies to it, and with his bill and wings endeavours to drive it off; but if a man or any large animal comes near, he flies ſcreaming to another tree; and if at that time any of his fellows happen to be returning to their neſts, he meets them, and, changing his note, obliges them to retire again: as ſoon as he perceives the danger over, he returns to his wonted round of viſiting the neſts.

Mexico, like all other American countries, abounds with reptiles, many of them of an enormous ſize. The crocodiles are not leſs to be dreaded than thoſe of Africa or Aſia; and there are likewiſe ſome of thoſe monſtrous ſerpents met with in the Eaſt Indies and in South America; though happily the ſpecies of thoſe terrible creatures ſeems to be nearly extinct, as they are ſeldom to be found but in ſome ſolitary wood, or other remote place. There are great numbers of lizards, ſome of which the people ſuppoſe to be poiſonous; but our author thinks this opinion ill founded. There are ſeveral kinds of poiſonous ſerpents, of which the rattle-ſnake is one. The *cenocoatl* is another poiſonous ſerpent, and remarkable for having a luminous appearance in the dark; by which, as by the rattle in the tail of the former, travellers are warned to avoid it. Among the harmleſs ſnakes is a very beautiful one about a foot in length, and of the thickneſs of the little finger. It appears to take great pleaſure in the ſociety of ants, inſomuch that it will accompany theſe inſects upon their expeditions, and return with them to their uſual neſt.—It is called both by the Mexicans and Spaniards the *mother of the ants;* but our author ſuppoſes that all the attachment which the ſnake ſhows to the ant-hills proceeds from its living on the ants themſelves. The ancient Mexicans were wont to take delight in keeping an harmleſs green ſnake which they catched in the fields, and which, when well fed, would grow to the length of five or ſix feet. It was generally kept in a tub, which it never left but to receive food from the hand of its maſter; and this it would take either mounted on his ſhoulder or coiled about his legs.

The aquatic animals are innumerable. Clavigero mentions a ſpecies of frogs ſo large that a ſingle one will weigh a pound, and which are excellent food.—Of fiſh proper for food, our author ſays that he has counted upwards of 100 ſpecies, without taking in the turtle, crab, lobſter, or any other cruſtaceous animal. The ſharks are well known for their voracity. A whole ſheep's ſkin, and even a large butcher's knife, has been found in the belly of one of them. They are accuſtomed to follow veſſels, to devour any filth that is thrown overboard; and, according to Oviedo, they have been known to keep up with ſhips ſailing before a fair wind for no leſs than 500 miles. The bottetto is a fiſh about eight inches in length, but exceſſively thick. While this fiſh lies alive upon the beach, it ſwells whenever it is touched to an enormous ſize, and boys often take pleaſure in making it burſt with a kick. The liver is ſo poiſonous as to kill with ſtrong convulſions in half an hour after it is eaten. The oechione is a round flat fiſh, of eight or ten inches in diameter; the under part of the body being perfectly flat, but the upper part convex; and in the centre, which is the higheſt part, it has a ſingle eye as large as that of an ox, furniſhed with eye-lids like the eyes of land animals. This eye remains open even after the fiſh is dead, and has an hideous appearance, ſo as ſometimes to ſtrike the ſpectators with horror. Campoi endeavours to prove, that this is the fiſh named by Pliny *uranoſcopos*. The Roman hiſtorian does not deſcribe this fiſh; but Clavigero obſerves, that the name of *uranoſcopos* might be equally applicable to all fiſh which have eyes upon the head that look up to the ſky, as ſkates and other flat fiſh. The axolotl is a great ugly water-lizard, remarkable for having a periodical evacuation of blood from the uterus, like the human ſpecies. It is eatable, taſtes like an eel, and the fleſh is looked upon to be good in conſumptions There are likewiſe a vaſt variety of ſhells, ſponges, and lithophyts. Hernandez gives the figure of a ſponge ſent to him from the Pacific Ocean, which was of the ſhape of a man's hand, but with ten or more fingers; of a clay colour, with black backs and red ſtreaks, harder than the common ſponges.

158 Inſects.

Of flying and other minute inſects, the number is prodigiouſly great. There are a variety of beetles: ſome of a green colour make a great noiſe in flying; on which account children are fond of them. There are great numbers of ſhining beetles, which make a delightful appearance at night, as well as the luminous flies which abound in the country. There are ſix kinds of bees and four kinds of waſps; of which laſt, one collects wax and honey of a very ſweet taſte: another is called the *wandering waſp* from its frequent change of abode; and in conſequence of theſe changes, it is conſtantly employed in collecting materials for its habitations. There is alſo a black hornet with a red tail, the ſting of which is ſo large and ſtrong, that it will not only penetrate a ſugar-cane but even the trunk of a tree. The lake of Mexico abounds with a kind of fly, the eggs of which are depoſited upon the flags and ruſhes in ſuch quantities as to form large maſſes. Theſe are collected by the fiſhermen, and carried to market for ſale. They are eaten by both Mexicans and Spaniards, and have much the ſame taſte as the caviare of fiſh. The Mexicans eat alſo the flies themſelves ground and made up with ſalt-petre. There are abundance of gnats in the moiſt places and lakes; but the capital, though ſituated upon a lake, is entirely free from them. There are other flies which make no noiſe in their flight, but cauſe a violent itching by their bite; and if the part be ſcratched, an open wound is apt to enſue. The butterflies are in vaſt numbers, and their

Mexico. their wings glow with colours far superior to those of Europe; the figures of some of them are given by Hernandez. But notwithstanding its beauties and advantages, Mexico is subject to the dreadful devastations of locusts, which sometimes occasion the most destructive famines.

There are some of the worms of Mexico made use of by the inhabitants as food; others are poisonous. There are great numbers of scolopendræ and scorpions, some of the former growing to an immense size. Hernandez says, that he has seen some of them two feet long and two inches thick. The scorpions are very numerous; and in the hot parts of the country their poison is so strong as to kill children, and give terrible pain to adults. Their sting is most dangerous during those hours of the day in which the sun is hottest. In the province of Michuacan is a singular species of ant, larger than the common one, with a greyish body and black head. On its hinder part is a little bag full of a sweet substance, of which children are very fond. The Mexicans suppose this to be a kind of honey collected by the insect; but Clavigero thinks it rather is its eggs. There is a mischievous kind of tick, which in the hot countries abounds among the grass. From thence it easily gets upon the cloaths, and from them upon the skin. There it fixes with such force, from the particular figure of its feet, that it can scarcely be got off. At first it seems nothing but a small black speck, but in a short time enlarges to such a degree, from the blood which it sucks, that it equals the size of a bean, and then assumes a leaden colour. Oviedo says, that the best and safest method of getting speedily rid of it is by anointing the part with oil, and then scraping it with a knife.—If it is not speedily removed, a wound is made similar to that which the nigera or chegoe makes. The following insects were eaten by the ancient Mexicans: 1. The *atelepitz*, a marsh beetle, resembling in shape and size the flying beetles, having four feet, and covered with an hard shell. 2. The *atopinan*, a marsh-grasshopper of a dark colour, and great size, being not less than six inches long and two broad. 3. The *ahuihuitla*, a worm which inhabits the Mexican lake, four inches long, and of the thickness of a goose-quill, of a tawney colour on the upper part of the body, and white upon the under part. It stings with its tail, which is hard and poisonous. 4. The *ocuiliztac*, a black marsh-worm, which becomes white on being roasted.

159
Curious zoophytes.

Among the curious productions of the animal kind to be met with in this country, Clavigero mentions a kind of zoophytes which he saw in the year 1751, in a house in the country, about ten miles from Angelopoli, towards the south-east. They were three or four inches long, and had four very slender feet, with two antennæ; but their body was nothing more than the fibres of the leaves, of the same shape, size, and colour with those of the other leaves of the trees upon which these creatures were found. Gemelli describes another kind of these zoophytes which are found in Manilla.

160
Silk and cochineal.

Mexico produces also silk-worms: and the manufacture of silk might be carried on to great advantage, were it not prohibited for some political reasons. Besides the common silk, there is another found in the woods, very white, soft, and strong. It grows on the trees in several maritime places, particularly in dry seasons. Unless by poor people, however, this silk is not turned to any use, partly from inattention to their interests, but "chiefly (says our author) to the obstructions which would be thrown in the way of any one who should attempt a trade of that kind. We know from Cortes's letters to Charles V. that silk used to be sold in the Mexican markets; and some pictures are still preserved, done by the ancient Mexicans upon a paper made of silk."

Cochineal is one of the most valuable products of Mexico, and great care is taken to rear the insect in different parts; but the best is that which comes from the province of Mizteca. Some have reckoned that more than 2500 bags of cochineal are sent every year from Mizteca to Spain; and the trade in that article carried on by the city of Oaxaca is computed at 200,000 crowns value.

161
General descript of the inhabitants.

Though Mexico, as we have seen, was originally inhabited by a number of different nations, yet all of them resembled each other pretty much, not only in character, but in external appearance. "They generally rather exceed (says our author) than fall under the middle size, and are well proportioned in all their limbs. They have good complexions, narrow foreheads, black eyes, clean, firm, white, and regular teeth; thick, black, coarse, glossy hair; thin beards, and generally no hair upon their legs, thighs, and arms, their skin being of an olive colour. There is scarcely a nation on earth in which there are fewer persons deformed; and it would be more difficult to find a single hump backed, lame, or squint-eyed man among a thousand Mexicans, than among an hundred of any other nation. The unpleasantness of their colour, the smallness of their foreheads, the thinness of their beards, and the coarseness of their hair, are so far compensated by the regularity and fine proportion of their limbs, that they can neither be called very beautiful nor the contrary, but seem to hold a middle place between the extremes. Their appearance neither engages nor disgusts; but among the young women of Mexico, there are many very beautiful and fair, whose beauty is at the same time rendered more winning by the natural sweetness of their manner of speaking, and by the pleasantness and natural modesty of their whole behaviour. Their senses are very acute, especially that of sight, which they enjoy unimpaired to the latest age. Their constitutions are sound, and their health robust. They are entirely free of many disorders which are common among the Spaniards; but of the epidemical diseases to which their country is occasionally subject, they are generally the victims: with them these diseases begin, and with them they end. One never perceives in a Mexican that stinking breath which is occasioned in other people by the corruption of the humours or indigestion. Their constitutions are phlegmatic; but the pituitous evacuations from their heads are very scanty, and they seldom spit. They become grey-headed and bald earlier than the Spaniards; and although most of them die of acute diseases, it is not very uncommon among them to attain the age of an hundred. They are now, and ever have been, moderate in eating, but their passion for strong liquors is carried to the greatest excess. Formerly they were kept within bounds by the severity of the laws; but now

now that thefe liquors are become fo common, and drunkennefs is unpunifhed, one half of the people feem to have loft their fenfes; and this, together with the poor manner in which they live, expofed to all the baneful impreffions of difeafe, and deftitute of the means of correcting them, is undoubtedly the principal caufe of the havoc which is made among them by epidemical diforders.

"Many perfons allow the Mexicans to poffefs a great talent of imitation, but deny them that of invention; a vulgar error, which is contradicted by the ancient hiftory of that people. Their minds are affected by the fame variety of paffions with thofe of other nations, but not to an equal degree. The Mexicans feldom exhibit thefe tranfports of anger, or frenzies of love, which are fo common in other countries. They are flow in their motions; and fhow a wonderful tenacity and fteadinefs in thofe works which require time and long continued attention. They are moft patient of injury and hardfhip; and where they fufpect no evil intention, are moft grateful for any kindnefs fhown: but fome Spaniards, who cannot diftinguifh patience from infenfibility, nor diftruft from ingratitude, fay proverbially, that the Indians are alike infenfible to injuries or benefits. That habitual diftruft which they entertain of all who are not of their nation, prompts them often to lie and betray; fo that good faith certainly has not been refpected among them fo much as it deferves. They are by nature taciturn, ferious, and auftere; and fhow more anxiety to punifh crimes than to reward virtues.

"Generofity and perfect difintereftednefs are the principal features of their character. Gold with the Mexicans has not that value which it enjoys elfewhere. They feem to give without reluctance what has coft them the utmoft labour to acquire. The neglect of felfifh interefts, with the diflike which they bear to their rulers, and confequently their averfion to perform the tafks impofed by them, feem to have been the only grounds of that much exaggerated indolence with which the Americans have been charged; and, after all, there is no fet of people in that country who labour more, or whofe labour is more neceffary. The refpect paid by the young people to the old, and by children to their parents, feem to be feelings that are born with them. Parents are very fond of their children; but the affection which hufbands bear to their wives is certainly lefs than that which wives bear to their hufbands; and it is very common for the men to love their neighbours wives better than their own.

Courage and cowardice feem alternately fo to affect their minds, that it is often difficult to determine whether the one or the other predominates. They meet dangers with intrepidity, when they proceed from natural caufes, but are eafily terrified by the ftern look of a Spaniard. That ftupid indifference about death and eternity, which many authors have thought inherent in the character of every American, is peculiar only to thofe who are yet fo rude and uninformed as to have no idea of a future ftate."

Thus much with refpect to the general character of the Mexicans: but our author obferves, that "the modern Mexicans are not in all refpects fimilar to the ancient, as the Greeks of thefe days have little refemblance to thofe who lived in the times of Plato and Pericles. The ancient Mexicans fhowed more fire, and were more fenfible to the impreffions of honour. They were more intrepid, more nimble, more active, more induftrious; but they were at the fame time more fuperftitious and cruel." Mexico.

162 Of the Toltecas and Chichemecas.

The Toltecas, who firft inhabited Mexico, were accounted much more polifhed than thofe who came after them, infomuch that in after ages it was cuftomary to diftinguifh people of ingenuity and learning by the name of Toltecas. They always lived in fociety, collected into cities, under the government of kings, and had regular laws. They were more addicted to the arts of peace than of war; and it was to them that the fucceeding nations owned themfelves indebted for their knowledge of the culture of grain, cotton, pepper, &c. They underftood the art of cafting gold and filver, and melting them in whatever forms they pleafed, acquiring alfo great reputation from their fkill in cutting gems of all kinds; and they were befides well verfed in the fciences of aftronomy and chronology.

According to the ancient hiftories of thefe people, they obferved, about an hundred years before the Chriftian era, how far the folar year exceeded the civil one; fupplying the defect, as we do, by the addition of a day once in four years. In the year 660, while their monarchy continued in Tula, a celebrated aftronomer, named Huematzin, affembled with the king's confent all the wife men of the nation; and, with their affiftance, painted a famous book named *Teoamoxtli*, or "divine book," in which were reprefented, in very plain figures, the origin of the Indians, their difperfion after the confufion of tongues of Babel, their journey in Afia, their firft fettlements in America, the founding of the kingdom of Tula, and their progrefs till that time: but thefe, and other accounts of their great knowledge and accuracy, favour too much of exaggeration, or perhaps invention, from both which it is impoffible to clear the Spaniards when fpeaking of American affairs.

163 Their progrefs in agriculture.

The Chichemecas derived their knowledge of agriculture from the Toltecas, and of confequence the Mexicans alfo. Being deftitute of ploughs or animals of fufficient ftrength to affift them in their labour, they made ufe of an inftrument of hard copper, which they called *coatl* or *coa*, but differing in fhape either from a fpade or mattock. They ufed copper axes to cut trees, the figure of which was the fame with ours; only that they put the ax into the eye of the handle, inftead of putting the handle into the eye of the ax as we do. They had feveral other inftruments of agriculture, but the forms of them are not mentioned by hiftorians. They watered their fields by means of the rivers and fmall torrents which came from the mountains; raifing dams to collect them, and forming canals to conduct them properly to the places which required moifture. They ufed inclofures of ftone, as well as hedges for the fields, ufing for their hedges the aloe plant, which is well calculated for the purpofe; and what reparations were neceffary they gave in December. They dibbled their maize: a method of fowing more flow indeed than the ordinary one, but which certainly repays the trouble by a vaftly larger crop, as well as by faving a very confiderable quantity of feed. Clofe to the newly-fown fields they com-

monly

Mexico. monly erected a small tower of wood, where a man kept watch, in order to drive away the birds that came to feed upon the grain; a custom still preserved among the Spaniards.

164 Magnificent gardens. In the cultivation of their gardens, the Mexicans were extremely skilful and magnificent; planting in them not only kitchen herbs, but fruit trees, medicinal herbs, and flowers, with great taste and regularity. Some of the royal gardens excited the admiration of the Spaniards so much, that Cortes, in a letter to Charles V. informed him that the garden at Huaxtepec was the most extensive, the most beautiful, and most delightful, that had ever been beheld. It was six miles in circumference, and watered by a beautiful river which crossed it; and there were pleasure-houses erected at proper distances from one another. It was for many years preserved by the Spaniards.——The plants most cultivated, next to maize, were cotton, cacao, and aloe; which last served a great many useful purposes. See Aloe.

165 Tame animals. Though they had not the advantage of the larger quadrupeds, as horses, oxen, or sheep, they bred up an immense number of quadrupeds unknown in Europe. Private persons brought up the small quadrupeds already mentioned, resembling little dogs; as well as turkeys, quails, geese, ducks, and other kinds of fowl. In the houses of the great men were bred fish, deer, rabbits, and a variety of birds; and in the royal palaces, almost all the species of quadrupeds and winged animals to be found in these kingdoms were kept, as well as a great number of aquatic animals and reptiles. According to Clavigero, Montezuma II. surpassed all the kings in the world in this kind of magnificence; and there never was a nation equal to the Mexicans in the care they took in taming animals.

166 Paintings. Painting was an art in great request among the Mexicans, and one of very great use; as it was only by means of paintings that they recorded their histories. This art they derived, like others, from the Toltecas. Some of these paintings were mere images of their gods, kings, heroes, or of terrestrial objects. Others were historical, containing an account of particular events; others mythological, of which a volume is preserved in the great library of the order of Bologna: others were codes of laws, civil and religious; while some were chronological, astronomical, or astrological; in which was represented their calendar, the position of the stars, changes of the moon, eclipses, and prognostications and variations of the weather. Great numbers of these were burned by the superstitious Spaniards, who imagined that they contained some emblems of heathen worship. They had likewise geographical paintings, which served not only to show the extent and boundaries of their possessions, but likewise the situation of places, the direction of the coasts, and the course of the rivers. In his first letter to Cha. V. Cortes says, that having made inquiries if there was any secure harbour for vessels on the Mexican coast, Montezuma presented him with a painting of the whole coast, from the port of Vera Cruz, at that time called *Chalchiuhuecan*, to the river Coatzacualco. Another author informs us also, that Cortes, in a long and difficult voyage which he made to the bay of Honduras, made use of a chart presented to him by the lords of Coatzacualco, in which all the places and rivers were marked from the coast of Coatzacualco to Huejacallan.

As every thing relating to the Mexican empire was thus delineated in painting, the artists were innumerable: and had the numerous paintings been preserved, we might by means of them have had a complete history of Mexico; but vast numbers were destroyed by the superstitious zeal of the Spaniards. The chief school of painting was in Tezcuco: and of the paintings made there they collected such a mass, that it resembled a little mountain; and to all these they set fire at once, to the inexpressible grief of the Indians, and even of themselves, when they came to know their error: for they were compelled afterwards to attempt to remedy the evil, by collecting all the paintings that could be found throughout the empire, and to obtain what information they could from the mouths of the Indians. But though they recovered many, these were still not sufficient; for, from that time forward, the possessors of paintings became so jealous, that they concealed them from the Spaniards with the utmost care; and it was in a manner impossible to make them part with a single piece.

The cloth on which these paintings were done was made of the thread of the aloe or a kind of palm; or they painted on sheeps skins or upon paper. This last was made of the leaves of a certain kind of aloe, steeped like hemp, and afterwards washed, stretched, and smoothed. They used also the bark of other trees, prepared with gum; but we are ignorant of the method they used in the manufacture. This paper is similar in thickness to the European pasteboard, but softer, smoother, and more easy for writing. In general it was made up in very long sheets, which they preserved in rolls, or folded like bed-skreens. The volume of Mexican paintings, preserved in the library of Bologna, is a thick skin, ill-dressed, composed of different pieces painted all over, and folded up in that manner. The beautiful colours which they employed both in their paintings and in their dyes, were obtained from wood, leaves, and the flowers of different plants, as well as from various animal substances. Their white was made from a kind of stone which burns into a fine plaster; or from a mineral, which after being made into a paste worked like clay, and formed into small balls, turns white in the fire like Spanish white. Their *black* was got from another mineral, which has a disagreeable smell, or from the soot of a kind of pine collected in small earthen vessels. They obtained *blue* and *azure* colours from indigo; but their mode of obtaining these was very different from that used by the moderns. They put the branches of the plant into hot, or rather lukewarm, water: and after having stirred them about for a sufficient time with a stick or laddle, they passed the water, when impregnated with the dye, into certain pots or cups in which they let it remain until the solid part of the dye was deposited; after which they poured off the water. This sediment was first dried in the sun, and afterwards put between two plates before a fire until it grew hard. They had another plant which likewise afforded a blue colour, but inferior to the indigo. *Red* was obtained from the seeds of the achiot or rocou,

rocou, and *purple* from cochineal. Their *yellows* were ochre, and a colour extracted from the beautiful flower of a plant refembling artemifia. With nitre thefe flowers afforded a fine orange colour; and by means of alum they extracted other colours.

The Mexican painters were by no means arrived at much perfection in the knowledge of light and fhade, or of defign; neverthelefs, in fome of the ancient paintings, particularly in the portraits of the kings, the proportions were exactly obferved. But this was by no means the cafe in their common paintings: though this is afcribed by Clavigero, not to the want of fkill in thefe painters, but to the hafte with which the figures were executed, and of which the Spaniards were witneffes. Befides paintings, however, the Mexicans are faid to have employed hieroglyphics and characters: but this is abfolutely denied by our author; who tells us, that "they reprefented material things by their proper figures; but, in order to fave labour, paper, and colours, they contented themfelves with reprefenting part of an object, which was fufficient to make it underftood. But as we cannot underftand the writings of others till we have learned to read them, in like manner thofe American authors, who fay that the Mexicans made ufe of characters, required to have been firft inftructed in the Mexican manner of reprefenting objects, in order to have been able to underftand the paintings which ferved them in place of writing. When they would reprefent any perfon, they painted a man, or a human head, and over it a figure expreffing the meaning of his name, as appears in the figures of the Mexican kings. To exprefs a city or village, they painted in like manner a figure which fignified the fame thing, with its name. To form their hiftories or annals, they painted on the margin of the cloth or paper the figures of the years in fo many fquares, and at the fide of each fquare the event or events which happened that year: and if, on account of the number of years, the hiftory of which they meant to relate, they could not all be contained in one canvas, they were continued on another. With refpect to the order of reprefenting the years and events, it was at the liberty of the hiftorian to begin at whichever angle of the piece he pleafed; but at the fame time conftantly obferving, that if the painting began at the upper angle of the right-hand, he proceeded towards the left; but if it began, as it moft commonly did, at the upper angle of the left hand, he proceeded ftraight downwards. If he painted the firft year at the lower angle of the left, he continued towards the right; but if he began at the lower angle of the right, he painted ftraight upwards: fo that on the upper part of his canvas he never painted from left to right, nor ever on the lower part from right to left; never advanced upwards from the left, nor downwards from the right. When this method of the Mexicans is underftood, it is eafy to difcover at firft fight which is the beginning and which the ending of any hiftorical painting. Their paintings, however, ought not to be confidered as a regular full hiftory, but only as monuments and aids of tradition. We cannot exprefs too ftrongly the care which parents and mafters took to inftruct their children and pupils in the hiftory of the nation. They made them learn fpeeches and difcourfes which they could not exprefs by the pencil; they put the events of their anceftors into verfe, and taught them to fing them. This tradition difpelled the doubts and undid the ambiguity which paintings alone might have occafioned; and, by the affiftance of thofe monuments, perpetuated the memory of their heroes and of virtuous examples; their mythology, rites, laws, and cuftoms. 169

Preferved the memory of events by knotted threads.

"Nor did that people only make ufe of tradition, paintings, and fongs, to preferve the memory of events, but alfo of threads of different colours and differently knotted. This curious method of the reprefentation of things, however much ufed in Peru, does not appear to have been employed in the province of Anahuac, if not in the moft early ages; for no traces of fuch monuments are now to be found. Boturini fays, that after the moft diligent fearch, he with difficulty found one in a place in Tlafcala, the threads of which were already wafted and confumed by time. If thofe who peopled South America ever paffed the country of Anahuac, they poffibly might have left there this art, which was afterwards abandoned for that of painting, introduced by the Toltecans or fome other nation ftill more ancient." 170

Their knowledge in fculpture.

The Mexicans arrived at greater perfection in fculpture, cafting of metals, and mofaic works, than in painting. Sculpture was likewife one of the arts exercifed by the ancient Toltecans; but the Mexicans had fculptors among them when they left their native country of Atztlan. Several of the Toltecan ftatues, however, were preferved till the time of the conqueft, particularly that of the idol Tlaloc, placed upon the mountain of the fame name, and fome gigantic ftatues in one of their temples. Stone and wood were the ufual materials of their ftatues: the former was worked with a chiffel made of flint; and, in fpite of the unfitnefs of the inftrument, fuch was the phlegmatic nature of the people, that they furmounted every difficulty arifing from the tedioufnefs of the work. In their ftatues they learned to exprefs all the attitudes and poftures of which the human body is capable. They obferved the proportions exactly, and could when neceffary execute the moft delicate ftrokes with the chiffel. They not only made entire ftatues, but cut out in wood and in ftone figures in baffo relievo; of which kind are thofe of Montezuma II. and one of his fons, recorded with praifes by Acofta. They alfo made ftatues of clay and wood, employing for thefe a chiffel of copper. The number of their ftatues was in proportion to that of their idols; but fo active were the Spanifh priefts in deftroying thefe, that there is now fcarce any veftige of them remaining. The foundation of the firft church in Mexico was laid with idols; on which occafion many thoufand ftatues of their gods were neceffarily broke in pieces. In cafting of metals, 171

Excelled in the art of cafting metals.

however, the Mexicans greatly excelled their works either of painting or fculpture. "The miracles they produced of this kind (fays Clavigero), would not be credible, if, befides the teftimony of thofe who faw them, a great number of curiofities of this kind had not been fent from Mexico to Europe. The works of gold and filver fent in prefents from the conqueror Cortes to Charles V. filled the goldfmiths of Europe with aftonifhment; who, as feveral authors of the period atteft, declared that they were altogether inimitable. The Mexican founders made both of gold and filver

Mexico.

ſilver the moſt perfect images of natural bodies. They made a fiſh in this manner, which had its ſcales alternately one of ſilver and the other of gold; a parrot with a moveable head, tongue, and wings; and an ape with a moveable head and feet, having a ſpindle in its hand in the attitude of ſpinning. They ſet gems in gold and ſilver, and made moſt curious jewellery of great value. In ſhort, theſe ſort of works were ſo admirably finiſhed, that even the Spaniſh ſoldiers, all ſtung with the ſame wretched thirſt for gold, valued the workmanſhip above the materials. This wonderful art, formerly practiſed by the Tolteca, the invention of which they aſcribed to one of their gods, has been entirely loſt by the debaſement of the Indians, and the indolent neglect of the Spaniards. We are doubtful if there are any remains of thoſe curious works; at leaſt we apprehend that it would be more eaſy to find them in ſome of the cabinets of Europe than in all New Spain. Covetouſneſs to profit by the materials muſt unqueſtionably have conquered all deſire to preſerve them as curioſities." The works of the Mexicans in gold and ſilver, executed with the hammer, were much inferior to thoſe of the Europeans.

172 Beautiful moſaic.

But of all the works executed by the ancient Mexicans, thoſe of moſaic were the moſt curious, as well as moſt highly valued by themſelves. Theſe were made of the feathers of birds; and for procuring them they reared a great number of thoſe birds of fine plumage, with which the country abounded, not only in the royal palaces, but alſo in private houſes; and at certain ſeaſons they carried off the feathers for theſe purpoſes, or to ſell them at market. They valued particularly the feathers of the humming birds, on account of their ſmallneſs, fineneſs, and various colours; and in theſe, as well as other birds of fine plumage, nature ſupplied them not only with all the colours producible by art, but likewiſe with many which art cannot imitate. Their moſaic works, as well as indeed all others of the Mexicans, required infinite patience. At the undertaking of every work of this kind ſeveral artiſts aſſembled; and having agreed upon a deſign, and fixed their meaſures and proportions, each artiſt charged himſelf with the execution of a certain part of the image, and exerted himſelf ſo diligently in it, that he frequently ſpent a whole day in adjuſting a feather; firſt trying one and then another, viewing it ſometimes one way, then another, until he found one which gave his part that ideal perfection propoſed to be attained. When the part which each artiſt undertook was done, they aſſembled again to form the entire image from them. If any part happened to be in the leaſt deranged, it was wrought again until it was perfectly finiſhed. They laid hold of the feathers with ſmall pincers, that they might not do them the leaſt injury, and paſted them on the cloth with ſome glutinous matter: then they united all the parts upon a little table or a plate of copper, and flattened them ſoftly until they left the ſurface of the image ſo equal and ſmooth, that it appeared to be the work of a pencil. Theſe works were prodigiouſly admired by the Spaniards. "It is wonderful (ſays Acoſta) how it was poſſible with the feathers of birds to execute works ſo fine and ſo equal, that they appear the performance of the pencil; and what neither the pencil nor the colours in painting can effect, they have, when viewed from a ſide, an appearance ſo beautiful, ſo lively, and ſo animated, that they give delight to the ſight. Some Indians, who are able artiſts, copy whatever is painted with a pencil ſo exactly with plumage, that they rival the beſt painters of Spain." The laſt artiſt in this admirable kind of work lived lately in Pazcuaro, the capital of Michuacan; but it is moſt probable that the art either has already died or will die with him. A beautiful kind of moſaic was likewiſe done with broken ſhells; and this is ſtill carried on in Guatimala. There were many other artiſts who formed figures in imitation of the moſaic works, with flowers and leaves upon mats, which were made uſe of at feſtivals; and theſe were eagerly ſought after by the Spaniſh nobility, on account of their ſingular beauty. Others imitated with ſilk the figures done with feathers; but theſe laſt were always greatly ſuperior.

The Mexicans were ſkilled in architecture even before they left their native country; and many edifices ſtill remain which were conſtructed by them during their frequent journeys from one place to another. At their firſt arrival on the lake, they had no other materials to build their houſes with but reeds and mud, until the ſucceſs of their commerce allowed them to purchaſe better materials. When the city came to its perfection, the houſes of the principal people were conſtructed of ſtone and lime: they conſiſted of two floors, having halls, large court-yards, and chambers fitly diſpoſed: the roofs were flat and terraced; the walls ſo well whitened, poliſhed, and ſhining, that they appeared to the Spaniards when at a diſtance to have been conſtructed of ſilver. The floor was paved with plaſter, perfectly level, plain, and ſmooth. Many of their houſes were crowned with battlements and turrets; and their gardens had fiſh-ponds, and the walks of them ſymmetrically laid out. The large houſes had in general two entrances, the principal one to the ſtreet, the other to the canal: they had no wooden doors to their houſes, but covered the entrance with ſmall reeds, from whence they ſuſpended a ſtring of cocoa ſhells, or ſome other materials which would make a noiſe, ſo as to awake the attention of the family when any perſon lifted up the reeds to enter the houſe. —The houſes of the poorer ſort were conſtructed of reeds, unburnt bricks, ſtone, or mud; and the roofs made of a kind of long hay which grows plentifully in the fields, particularly in the warm parts of the country. For this purpoſe they uſed alſo the leaves of the aloe placed in the manner of tiles, to which they bear ſome reſemblance both in thickneſs and ſhape. One of the columns or ſupports of theſe houſes was generally a tree in the vigour of its growth; by which means, beſides the pleaſure derived from its foliage and ſhade, they ſaved themſelves ſome labour and expence. Theſe houſes had one or more apartments according to the circumſtances of the family.

Our author is of opinion, that the ancient Mexicans underſtood the method of conſtructing arches or vaults, as appears, he ſays, from ſome remains of their buildings as well as from their paintings. They had likewiſe cornices and other ornaments of architecture. They had alſo ſquare or cylindrical columns; but it is not known whether theſe had any capitals or not. They frequently adorned them with figures in *baſſo relievo*;

relievo; but their great ambition was to have them all made out of one ſtone. The foundations of the large houſes in the capital were laid upon beams of cedar driven into the ground, on account of its want of ſolidity; and the ſame method is ſtill practiſed by the Spaniards. The roofs of theſe were made of cedar, fir, cypreſs, pine, &c. In the royal palaces the columns were of marble or even of alabaſter, which the Spaniards miſtook for jaſper. In the reign of Ahuizotl a new kind of ſtone, named *tetzontli*, was diſcovered in the Mexican lake, which was ever afterwards made uſe of for building. It is hard, light, and porous like a ſponge; by which means the lime adheres very firmly to it. It is valued likewiſe on account of its colour, which is a blood red. Some of the pavements were chequered with marble and other valuable ſtones.

The moſt remarkable pieces of Mexican architecture, however, were their aqueducts. There were two which conveyed the water to the capital from the diſtance of two miles. Theſe were conſtructed of ſtone and cement five feet high, and two paces broad, upon a road for that purpoſe upon the lake; by which the water was brought to the entrance of the city, from whence it was ſent forth in ſmaller channels to ſupply the different fountains. The famous aqueduct of Chempoallan, which was done in the 16th century, is worthy of being ranked among the greateſt in Europe. The conductor of this work was a Franciſcan miſſionary named *Tembleque*; and it was executed with great ſkill by the Chempoalleſe. The water was brought from a great diſtance, and the country through which it muſt paſs was mountainous and rocky; but every difficulty was overcome by the induſtry of the Mexicans. The aqueduct, including all the turnings and windings, exceeded 30 miles in length. The principal difficulty conſiſted in croſſing three great precipices, over which they were obliged to conſtruct three bridges, the firſt of 47, the ſecond of 13, and the third of 67 arches. The largeſt arch was 100 feet high, and 61 broad; ſo that a large veſſel could have paſſed under it. It muſt, however, be obſerved, that, in executing this undertaking, the Mexicans were undoubtedly aſſiſted by European tools, and the directions of European workmen; ſo that we cannot with ſtrict propriety call it one of their works.

Though the ancient Mexicans never uſed any inſtruments of iron in their works, they nevertheleſs executed beautiful engravings by means of tools made of flint ſtone. They wrought alſo marble, jaſper, alabaſter, itztli, and other valuable ſtones. Of itztli they made their looking-glaſſes, which were ſometimes ſet in gold, the ſharp pieces which were ſet in their ſwords, and razors to ſhave with. Theſe laſt were made with ſuch expedition, that an artiſt could finiſh upwards of *an hundred* in an hour.

They were, as has already been obſerved, expert jewellers, and underſtood the art of cutting and poliſhing the ſtones, as well as of ſetting them. The gems moſt common in their country were the emeralds, amethyſts, cornelians, turquoiſes, and others unknown in Europe. Emeralds were ſo common, that no lord or noble wanted them; and none of them died without having one fixed to his lip, that it might ſerve him, as they imagined, in the other world, inſtead of a heart. When Cortes returned the firſt time to Spain, he brought with him five emeralds valued, by the jewellers there, at 100,000 ducats. The firſt was in the form of a roſe; the ſecond of an horn; the third of a little fiſh with eyes of gold; the fourth in the form of a bell, with a fine pearl for a clapper. The fifth was a ſmall cup with a foot of gold, and four little golden chains which united in a pearl in the form of a button. For this alone the Genoeſe merchants offered 40,000 ducats, in order to ſell it again to the grand ſignior. Beſides theſe, he had two emerald vaſes valued at 300,000 ducats; but theſe laſt were loſt by ſhipwreck in the unfortunate expedition of Charles V. againſt Algiers. There are no ſuch gems wrought at preſent, nor is it even known where the emerald mines are ſituated; though there are ſtill extant ſome enormous maſſes of this precious ſtone, particularly two in as many churches; but the prieſts take care to ſecure them with iron chains, leſt any body ſhould carry them off.

176 Manufactures of different kinds.

In other more common manufactures the Mexicans were by no means deficient. The earthen ware of Cholula was much praiſed by the Spaniards; and they had the art of ornamenting this kind of ware with various colours, though they did not underſtand the making of glaſs. Their carpenters wrought with inſtruments of copper; and there are ſtill remains of their labours which diſplay a tolerable ſkill. Almoſt every one was acquainted with the method of making cloth. Being deſtitute of wool, common ſilk, lint, or hemp, they were obliged to ſupply the deficiency by other materials. For wool they ſubſtituted cotton, for ſilk they uſed feathers, the wool of the hare or rabbit; and inſtead of lint and hemp, they uſed the fibrous part of the leaves of the aloe. From theſe laſt they obtained a thread as fine as from lint; and from ſome ſpecies they had a coarſer ſort reſembling hemp. To obtain this thread they ſoaked the leaves in water, cleaned them, expoſed them to the ſun, and then beat them till they were fit to be ſpun. Sometimes they interwove with their cotton the fineſt down on the belly of the rabbits or hares, after having ſpun it into thread; and of theſe they made moſt beautiful cloths, which were particularly uſed for winter waiſtcoats for the lords. Their cotton manufactures were equal to any produced in Europe; they wove them with different figures and colours, repreſenting different animals and flowers. Of feathers interwoven with cotton they made mantles and bed-curtains, carpets, gowns, &c. Theſe were exceedingly beautiful; but this kind of manufactory is now loſt, though there are ſtill ſome of theſe garments in the poſſeſſion of the principal lords, who wear them upon ſolemn occaſions.

177 Their horrible religion.

All theſe advances towards civilization, however, in the ancient Mexicans, were much more than counterbalanced by the horrible barbarities they committed in their religious ceremonies, and in which they exceeded every nation on earth. Human ſacrifices were indeed in uſe among all the ancient heathens; but ſuch prodigious maſſacres as have been already related at the dedication of their temples, are unheard of in hiſtory. Whether they uſed theſe barbarous ſacrifices in their own country, or whether the practice began with that of the four Xochimilca priſoners, of whom we have already given an account, is not known;

Mexico.

known; but as they only uſed their priſoners or ſlaves whom they bought in this way, it is impoſſible that, during the infancy of their ſtate, the number of human victims could have been very great. Moſt of thoſe unhappy creatures periſhed by having their breaſts opened, and their hearts pulled out; ſome were drowned, others ſtarved to death with hunger; and ſometimes they were burnt. Priſoners of high rank were allowed to die by what Clavigero calls the *gladiatorian* ſacrifice, which was performed in the following manner. Near to the greater temple of large cities, in an open ſpace of ground ſufficient to contain an immenſe number of people, was a round terrace eight feet high, upon which was placed a large round ſtone reſembling a milſtone in ſhape, but much larger, almoſt three feet high, well poliſhed, and having figures cut upon it. On this ſtone, which was called *temalcatl*, the priſoner was placed, armed with a ſhield and ſhort ſword, and tied by one foot. Here he was encountered by a Mexican officer or ſoldier better armed than himſelf. If the priſoner was vanquiſhed, he was carried, dead or alive, to the temple, where his heart was taken out and offered in the uſual manner; but if he conquered ſix combatants, he gained his life and liberty. An inſtance, however, is given in which this cuſtom was infringed; for the Huetzotzincas having taken the principal lord of Cholula, a man of ſingular bravery, he overcame ſeven combatants; notwithſtanding which he was put to death; but on this account the Huetzotzincas were rendered forever infamous among theſe nations.

178 Gladiatorian ſacrifice.

179 Number of human victims annually ſacrificed.

Hiſtorians differ concerning the number of victims who periſhed annually in theſe ſacrifices: Clavigero inclines to think it was 20,000, but others make it much more. Zumarraga, the firſt biſhop of Mexico, ſays in a letter of the 12th of June 1531, addreſſed to the general chapter of his order, that in that capital alone there were above 20,000 victims annually ſacrificed. Some authors, quoted by Gomara, ſay that 50,000 were annually ſacrificed in the various parts of the empire. Acoſta ſays, that there was a certain day of the year on which they ſacrificed 5000 victims, and another on which 20,000 were ſacrificed. According to others they ſacrificed, on the mountain Tepeyacac only, 20,000 annually to one of their female deities. On the other hand, Bartholomew de las Caſas reduces the number of human victims to 50 or at moſt to 100. "We are ſtrongly of opinion (ſays Clavigero), that all theſe authors have erred in the number; Las Caſas by diminution, and the reſt by exaggerating the truth."

180 Their monſtrous auſterities.

Beſides theſe cruelties which they practiſed upon others, the Mexicans were accuſtomed to treat themſelves with the moſt inhuman auſterities, thinking that the diabolical rage of their deities would be appeaſed by human blood. "It makes one ſhudder (ſays Clavigero), to read the auſterities which they practiſed upon themſelves, either in atonement for their tranſgreſſions, or in preparation for their feſtivals. They mangled their fleſh as if it had been inſenſible, and let their blood run in ſuch profuſion as if it had been a ſuperfluous fluid in the body. The effuſion of blood was frequent and daily with ſome of their prieſts. They pierced themſelves with the ſharpeſt ſpines of the aloe, and bored ſeveral parts of their bodies, particularly their ears, lips, tongue, and the fat of their arms and legs. Through the holes which they made with theſe ſpines they introduced pieces of cane, the firſt of which were ſmall; but every time this penitential ſuffering was renewed a thicker piece was made uſe of. The blood which flowed from them was carefully collected in the leaves of the plant *acxojatl*. They fixed the bloody ſpines in little balls of hay, which they expoſed upon the battlements of the walls of the temple, to teſtify the penance which they did for the people. Thoſe who exerciſed ſuch ſeverities upon themſelves within the incloſure of the greater temple of Mexico, bathed in a pond that was formed there, and which, from being always tinged with blood, was called *ezapan*."

Dreſs.

The dreſs of the Mexicans was very ſimple; that of the men conſiſted only of a large belt or girdle, the two ends of which hung down before and behind; the women wore a ſquare mantle, about four feet long; the two ends were tied upon the breaſt or upon one ſhoulder. The Mexican gown was alſo a piece of ſquare cloth, in which the women wrapped themſelves from the waiſt down to the middle of the leg. They wore alſo a ſmall under-veſt or waiſtcoat without ſleeves, named *huepilli*.

The dreſs of the poorer ſort was made of the thread of the mountain palm, or of coarſe cotton; but thoſe of better ſtation wore the fineſt cotton embelliſhed with various colours, and figures of animals or flowers; or woven with feathers, or the fine hair of the rabbit, &c. The men wore two or three mantles, and the women three or four veſts, and as many gowns, putting the longeſt undermoſt, ſo that a part of each of them might be ſeen. Their ſhoes were only ſoles of leather, or coarſe cloth of the mountain palm tied with ſtrings; but thoſe of the great people were adorned with ribbands of gold and jewels. They all wore long hair, and thought themſelves diſhonoured by being ſhaved, or having their hair clipped, except the conſecrated virgins in the temple. The women wore it looſe; but the men tied it up in different forms, and adorned their heads with fine feathers, both when they danced and went to war. With this ſimplicity, however, they mixed no ſmall quantity of extravagance. Beſides feathers and jewels, with which they uſed to adorn their heads, they wore ear-rings, pendants at their upper lip, as well as many at their noſes, necklaces, bracelets for the hands and arms, as well as certain rings like collars which they wore about their legs. The ear-rings of the poor were ſhells, pieces of cryſtal, amber, &c.; but the rich wore pearls, emeralds, amethyſts, or other gems, ſet in gold.

Inſtead of ſoap the Mexicans uſed a kind of fruit called *copalxocotl;* the pulp of which is white, viſcous, and very bitter, makes water white, raiſes a froth, and will clean linen like ſoap. They uſed alſo a kind of root named *amolli*, which is not unlike the *ſaponaria* of the old continent. It is now more uſed for waſhing the body, eſpecially the head, than for clothes. Clavigero ſays that there is a kind of this root which dyes the hair of a golden colour, and that he has been witneſs to this effect on the hair of an old man.

181 Modern inhabitants, &c.

The principal inhabitants of Mexico, in modern times, are Spaniards ſent hither by the court, to fill the

the posts of government. They are obliged, like those in the mother-country who aspire to any ecclesiastical, civil, or military employments, to prove that there have been neither heretics, Jews, Mohammedans, nor any person in their family who have been called before the inquisition for four generations. Merchants who are desirous of going to Mexico, as well as to other parts of America, without becoming colonists, are compelled to observe the same forms. They are also obliged to swear that they have 300 palms of merchandise, their own property, in the fleet in which they embark, and that they will not carry their wives with them. On these absurd conditions they become the principal agents of the European commerce with the Indies. Though their charter is only to continue three years, and a little longer for countries more remote, it is of great importance. To them alone belongs the right of selling, as commissioners, the major part of the cargo. If these laws were observed, the merchants stationed in the new world would be confined to dispose of what they have received on their own account.

The predilection which administration has for Spaniards born in Europe, has reduced the Spanish Creoles to acquiesce in subordinate stations. The descendants of the companions of Cortes, and of those who came after them, being constantly excluded from all places of honour or of trust that were any way considerable, have seen the gradual decay of the power that supported their fathers. The habit of being obliged to bear that unjust contempt with which they have been treated, has at last made them become really contemptible. They have totally lost, in the vices which originate from indolence, from the heat of the climate, and from a superfluous enjoyment of all things, that firmness and that sort of pride which have ever characterised their nation. A barbarous luxury, shameful pleasures, and romantic intrigues, have enervated all the vigour of their minds, and superstition hath completed the ruin of their virtues. Blindly devoted to priests too ignorant to enlighten them by their instructions, too depraved to edify them by their example, and too mercenary to attend to both these duties of their function, they have no attachment to any part of their religion but that which enfeebles the mind, and have neglected what might have contributed to rectify their morals.

The Mestees, who constitute the third order of citizens, are held in still greater contempt. It is well known that the court of Madrid, in order to replenish a part of that dreadful vacancy which the avarice and cruelty of the conquerors had occasioned, and to regain the confidence of those who had escaped their fury, encouraged as much as possible the marriage of Spaniards with Indian women. These alliances, which became pretty common throughout all America, were particularly frequent in Mexico, where the women had more understanding and were more agreeable than in other places. The Creoles transferred to this mixed progeny the contemptuous slight they received from the Europeans. Their condition, equivocal at first, in process of time was fixed between the whites and the blacks.

These blacks are not very numerous in Mexico. As the natives are more intelligent, more robust, and more industrious, than those of the other colonies, they have hardly introduced any Africans except such as were required either to indulge the caprice, or perform the domestic service, of rich people. These slaves, who are much beloved by their masters, on whom they absolutely depend, who purchased them at an extravagant price, and who make them the ministers of their pleasures, take advantage of the high favour they enjoy, to oppress the Mexicans. They assume over these men, who are called *free*, an ascendant which keeps up an implacable hatred between the two nations. The law has studied to encourage this aversion, by taking effectual measures to prevent all connection between them. Negroes are prohibited from having any amorous correspondence with the Indians; the men, on pain of being mutilated; the women, of being severely punished. On all these accounts, the Africans, who in other settlements are enemies to Europeans, are in the Spanish Indies their warm friends.

Authority has no need of this support, at least in Mexico, where population is no longer what it was formerly. The first historians, and those who copied them, have recorded, that the Spaniards found there 10,000,000 of souls. This is supposed to have been the exaggerated account of conquerors, to exalt the magnificence of their triumph; and it was adopted, without examination, with so much the more readiness, as it rendered them the more odious. We need only trace with attention the progress of those ruffians who at first desolated these fine countries, in order to be convinced that they had not succeeded in multiplying men at Mexico and the adjacent parts, but by depopulating the centre of the empire; and that the provinces which are remote from the capital, differed in nothing from the other deserts of South and North-America. It is making a great concession, to allow that the population of Mexico has only been exaggerated one-half: for it does not now much exceed 2,000,000.

183 Mexicans cruelly treated by the Spaniards.

It is generally believed, that the first conquerors massacred the Indians out of wantonness, and that even the priests incited them to these acts of ferocity. Undoubtedly these inhuman soldiers frequently shed blood without even an apparent motive; and certainly their fanatic missionaries did not oppose these barbarities as they ought to have done. This was not, however, the real cause, the principal source of the depopulation of Mexico; it was the work of a slow tyranny, and of that avarice which exacted from its wretched inhabitants more rigorous toil than was compatible with their constitution and the climate.

This oppression was coeval with the conquest of the country. All the lands were divided between the crown, the companions of Cortes, and the grandees or ministers who were most in favour at the court of Spain. The Mexicans, appointed to the royal domains, were destined to public labours, which originally were considerable. The lot of those who were employed on the estates of individuals was still more wretched. All groaned under a dreadful yoke: they were ill-fed; they had no wages given them; and services were required of them, under which the most robust men would have sunk. Their misfortunes excited the compassion of Bartholomew de las Casas.

184 Bartholomew de las Casas takes their part.

This

Mexico. This man, so famous in the annals of the new world, had accompanied his father in the first voyage made by Columbus. The mildness and simplicity of the Indians affected him so strongly, that he made himself an ecclesiastic, in order to devote his labours to their conversion. But this soon became the least of his attention. As he was more a *man* than a *priest*, he felt more for the cruelties exercised against them than for their superstitions. He was continually hurrying from one hemisphere to the other, in order to comfort the people for whom he had conceived an attachment, or to soften their tyrants. This conduct, which made him be idolized by the one and dreaded by the other, had not the success he expected. The hope of striking awe, by a character revered among the Spaniards, determined him to accept the bishoprick of Chiapa in Mexico. When he was convinced that this dignity was an insufficient barrier against that avarice and cruelty which he endeavoured to check, he abdicated it. It was then that this courageous, firm, disinterested man, accused his country before the tribunal of the whole universe. In his account of the tyranny of the Spaniards in America, he accuses them of having destroyed 15,000,000 of Indians. They ventured to find fault with the acrimony of his style; but no one convicted him of exaggeration. His writings, which indicate the amiable turn of his disposition, and the sublimity of his sentiments, have stamped a disgrace upon his barbarous countrymen, which time hath not, and never will, efface.

185 In consequence of which their condition is rendered somewhat easier.

The court of Madrid, awakened by the representations of the virtuous Las Casas, and by the indignation of the whole world, became sensible at last, that the tyranny it permitted was repugnant to religion, to humanity, and to policy, and resolved to break the chains of the Mexicans. Their liberty was now only constrained by the sole condition, that they should not quit the territory where they were settled. This precaution owed its origin to the fear that was entertained of their going to join the wandering savages to the north and south of the empire.

With their liberty their lands ought also to have been restored to them; but this was not done. This injustice compelled them to work solely for their oppressors. It was only decreed, that the Spaniards, in whose service they laboured, should stipulate to keep them well, and pay them to the amount of 5 l. 5 s. a year.

From these profits the tribute imposed by government was subtracted, together with 4 s. 4½ d. for an institution which it is astonishing the conquerors should have thought of establishing. This was a fund set apart in each community, and appropriated to the relief of such Indians as were decayed or indisposed, and to their support under private or public calamities.

The distribution of this fund was committed to their caciques. These were not the descendants of those whom they found in the country at the time of the conquest. The Spaniards chose them from among those Indians who appeared the most attached to their interests; and were under no apprehensions at making these dignities hereditary. Their authority was limited to the supporting the police in their district, which in general extended eight or ten leagues; to the collecting the tribute of those Indians who laboured on their own account, that of the others being stopt by the masters whom they served; and to the preventing their flight by keeping them always under their inspection, and the not suffering them to contract any engagement without their consent. As a reward of their services, these magistrates obtained from government a property. They were permitted to take out of the common stock 2¼ d. annually for every Indian under their jurisdiction. At last they were empowered to get their fields cultivated by such young men as were not yet subject to the poll tax; and to employ girls, till the time of their marriage, in such occupations as were adapted to their sex, without allowing them any salary except their maintenance.

These institutions, which totally changed the condition of the Indians of Mexico, irritated the Spaniards to a degree not to be conceived. Their pride would not suffer them to consider the Americans as free men; nor would their avarice permit them to pay for labour which hitherto had cost them nothing. They employed themselves successively, or in combination, craft, remonstrances, and violence, to effect the subversion of an arrangement which so strongly contradicted their warmest passions; but their efforts were ineffectual. Las Casas had raised up for his beloved Indians protectors who seconded his design with zeal and warmth. The Mexicans themselves, finding a support, impeached their oppressors before the tribunals; and even the tribunals that were either weak or in the interest of the court. They carried their resolution so far, as even unanimously to refuse to work for those who had treated any of their countrymen with injustice. This mutual agreement, more than any other circumstance, gave solidity to the regulations which had been decreed. The other, prescribed by the laws, was gradually established. There was no longer any regular system of oppression; but merely several of those particular vexations which a vanquished people, who have lost their government, can hardly avoid from those who have subdued it.

These clandestine acts of injustice did not prevent the Mexicans from recovering, from time to time, certain detached portions of that immense territory of which their fathers had been despoiled. They purchased them of the royal domain, or of the great proprietors. It was not their labour which enabled them to make these acquisitions: for this they were indebted to the happiness of having discovered some of them mines, others treasures, which had been concealed at the time of the conquest. The greatest number derived their resources from the priests and monks, to whom they owed their existence.

Even those who experienced a fortune less propitious, procured for themselves, by the sole profits of their pay, more conveniences than they had enjoyed before they underwent a foreign yoke. We should be very much deceived if we should judge of the ancient prosperity of the inhabitants of Mexico by what has been said of its emperor, its court, its capital, and the governors of its provinces. Despotism had there produced those fatal effects which it produces every-where. The whole state was sacrificed to the

caprices,

caprices, pleafures, and magnificence, of a fmall number of perfons.

The government drew confiderable advantages from the mines which it caufed to be worked, and ftill greater from thofe which were in the hands of individuals. The falt-works greatly added to its revenue. Thofe who followed agriculture, at the time of harveft paid in a kind of a third of all the produce of the lands, whether they belonged to them as their own property, or whether they were only the farmers of them. Men who lived by the chace, fifhermen, potters, and all mechanics, paid the fame proportion of their induftry every month. Even the poor were taxed at certain fixed contributions, which their labour or their alms might put them in a condition to pay.

The Mexicans are now lefs unhappy. Our fruits, our corn, and our cattle, have rendered their food more wholfefome, agreeable, and abundant. Their houfes are better built, better difpofed, and better furnifhed. Shoes, drawers, fhirts, a garment of wool or cotton, a ruff, and a hat, conftitute their drefs. The dignity which it has been agreed to annex to thefe enjoyments has made them better economifts, and more laborious. This cafe, however, is far from being univerfal; it is even very uncommon in the vicinity of the mines, towns, and great roads, where tyranny feldom fleeps: but we often find it with fatisfaction in remote parts, where the Spaniards are not numerous, and where they have in fome meafure become Mexicans.

The employments of this people are very various. The moft intelligent, and thofe who are in eafy circumftances, devote themfelves to the moft neceffary and moft ufeful manufactures, which are difperfed through the whole empire. The moft beautiful manufactures are eftablifhed among the people of Tlafcala. Their old capital, and the new one, which is called *Angelos*, are the centre of this induftry. Here they manufacture cloth that is pretty fine, callicoes that have an agreeable appearance, certain flight filks, good hats, gold lace, embroidery, lace, glaffes, and a great deal of hard-ware.

The care of flocks affords a maintenance to fome Mexicans, whom fortune or nature have not called to more diftinguifhed employments. America, at the time it was difcovered, had neither hogs, fheep, oxen, horfes, nor even any domeftic animal. Columbus carried fome of thefe ufeful animals to St Domingo, from whence they were generally difperfed, and at Mexico more than in any other place. Thefe have multiplied prodigioufly. They count their horned cattle by thoufands, whofe fkins are become an object of confiderable exportation. The horfes are degenerated, but the quality is compenfated by the number. Hog's lard is here fubftituted for butter. Sheep's wool is dry, coarfe, and bad, as it is every where between the tropics.

The vine and olive-tree have experienced the fame degeneracy. The cultivation of them was at firft prohibited, with a view of leaving a free market for the commodities of the mother-country. In 1706, permiffion was given to the Jefuits, and a little afterwards to the marquis Del Valle, a defcendant from Cortes, to cultivate them. The attempts have not proved fuccefsful. The trials, indeed, that have been made, have not been abandoned; but no perfon has folicited the liberty of following an example which did not promife any great emoluments. Other cultures have been more fuccefsful. Cotton, fugar, filk, cocoa, tobacco, and European corn, have all thriven in fome degree. The Spaniards are encouraged to profecute the labours which thefe cultures require, from the happy circumftance of their having difcovered iron mines, which were entirely unknown to the Mexicans, as well as fome mines of a kind of copper that is hard enough to ferve for implements of hufbandry. All thefe articles, however, for want of men and induftry, are merely confumed within the country.—There is only the vanilla, indigo, and cochineal, which make part of the trade of Mexico with other nations.

New-Mexico, fo called becaufe of its being difcovered later than Old-Mexico, a country of America, is bounded on the north by high mountains, beyond which is a country altogether unknown; by Louifiana on the eaft; by New-Spain on the fouth; and on the weft by the gulph of California, and the Rio Colorado; extending, it is faid, above 100 miles from eaft to weft, and about 900 from fouth to north; but the twentieth part of the country within thefe limits is neither cultivated nor inhabited either by Spaniards or Indians. As it lies in the midft of the temperate zone, the climate, in general, is very pleafant; the fummers, though very warm, are neither fultry nor unwholefome; and the winters, though pretty fharp, are far from being infupportable, and, for the moft part, clear and healthy.

The greateft encomiums are lavifhed on the fertility of the foil, the richnefs of the mines, and the variety of valuable commodities produced in this country. It is faid to be beautifully diverfified with fields, meadows, rifing grounds, and rivers; abounding with fruit and timber-trees, turquoifes, emeralds, and other precious ftones, mines of gold and filver, a great variety of wild and tame cattle, fifh and fowls. Upon the whole, we may fafely affirm, that New-Mexico is among the pleafanteft, richeft, and moft plentiful countries in America, or any other part of the world. There are few great or navigable rivers in it: the moft confiderable are, the Rio Solado and Rio del Norte, which, with feveral fmaller ftreams, fall into the gulph of Mexico. On the coaft of the gulph are divers bays, ports, and creeks, which might be eafily converted into excellent harbours if the Spaniards were poffeffed of any portion of that commercial fpirit which animates the other maritime nations of Europe.

The Spanifh writers tell us, that New-Mexico is inhabited by a great variety of Indian nations or tribes, totally unconnected with each other: but the principal are the Apaches, a brave, warlike, refolute people; fond of liberty, and the inveterate enemies of tyranny and oppreffion. About the clofe of the laft century, thinking themfelves aggrieved by the Spanifh government, they made a general infurrection, and did a great deal of mifchief; but were at laft obliged to fubmit, and have fince been curbed by ftronger garrifons. Moft of the natives are now Chriftians. When the

the Spaniards first entered this country, they found the natives well clothed, their lands cultivated, their villages neat, and their houses built with stone. Their flocks also were numerous, and they lived more comfortably than most of the other savages of America. As to religion, they were idolaters, and worshipped the sun and moon; but whether they offered human sacrifices, we are not sufficiently informed.

As to the number of the provinces of this country, we can advance nothing certain: some writers making them only five, others 10, 15, 20, and 25; but adding no description, either of them or the towns contained in them, excepting the capital, Santa Fé, which we are told stands near the source of the Rio del Norte, in 36° of north latitude, and about 130 leagues from the gulph: that it is a well-built, handsome, rich town; and the seat of the bishop, suffragan of Mexico, as well as the governor of the province, who is subordinate to the viceroy of Mexico, or New-Spain.

MEYER (Felix), an eminent landscape painter, was born at Winterthur in 1653, and received his earliest instruction from a painter at Nuremburg: but he was afterwards a disciple of Ermels, a good landscape painter, whose manner he entirely followed.—In search of still greater improvement, however, he travelled to Italy: but the climate not agreeing with his constitution, he retired to Switzerland; where, as he was indefatigable in surveying all the beauty, the wildness, and magnificence of nature in those romantic scenes, he made a multitude of noble designs, which procured him very high reputation. As he was not expert at painting figures, those which he inserted in his own pictures being very indifferent, such of his landscapes as were supplied with figures by Roos or Rugendas, are accounted most estimable. He died in 1713.

MEYSENS (John), a painter of considerable eminence, was born at Brussels in 1612; and at first was taught the principles of painting by Anthony van Opstal, but afterwards he became a disciple of Nicholas vander Horst When he commenced painter, he undertook both history and portrait: but the latter seems to have been his principal employment; and his reputation for that style of painting became very great throughout the Low Countries. His remarkable excellence consisted in his producing a very striking resemblance, in his finishing his pictures with a great deal of care, and in giving them a lively and good expression.

MEZERAY (Francis Eudes de), an eminent French historian, the son of Isaac Eudes a surgeon, was born at Rye, in Lower Normandy, in 1610; and took the surname of *Mezeray*, from a hamlet near Rye. Having performed his studies at Caen, he discovered a strong inclination to poetry; but going to Paris, he, by the advice of one of his friends, applied himself to the study of politics and history, and procured the place of commissary at war, which he held for two campaigns. He then shut himself up in the college of St Barbe, in the midst of books and manuscripts; and, in 1643, published the first volume of the History of France, in folio; and some years after, the other two volumes. Mezeray in that work surpassed all who had written the history of France before him, and was rewarded by the king with a pension of 4000 livres. In 1668, he published an Abridgement of his History of France, in three volumes 4to, which was well received by the public: but as he inserted in that work the origin of most of the taxes with very free reflections, Mr Colbert complained of it, when Mezeray promised to correct what he had done in a second edition: but those corrections being only palliations, the minister caused half of his pension to be suppressed. Mezeray complained of this in very severe terms; when he obtained no other answer than the suppression of the other half. Vexed at this treatment, he resolved to write on subjects that could not expose him to such disappointments; and composed his treatise on the origin of the French, which did him much honour. He was elected perpetual secretary to the French academy; and died in 1683. He is said to have been a man extremely negligent in his person; and so careless in his dress, that he might have passed for a beggar rather than for what he was. He was actually seized one morning by the *archers des pauvres*, or parish-officers; which mistake was so far from provoking him, that he was highly diverted with it, and told them, that "he was not able to walk on foot, but that as soon as a new wheel was put to his chariot, he would attend them wherever they thought proper." He used to study and write by candle-light, even at noon day in summer; and, as if there had been no sun in the world, always waited upon his company to the door with a candle in his hand. With regard to religion, he affected Pyrrhonism; which however was not, it seems, so much in his heart as in his mouth. This appeared from his last sickness: for having sent for those friends who had been the most usual witnesses of his licentious talk about religion, he made a sort of recantation, which he concluded with desiring them "to forget what he might formerly have said upon the subject of religion, and to remember, that Mezeray dying was a better believer than Mezeray in health." Besides his history, he also wrote, 1. A continuation of the history of the Turks. 2. A French translation of John de Sarisbury's Latin treatise on the vanities of the court. 3. There are attributed to him several satires against the government; and in particular, those that bear the name of *Sandricourt*.

MEZIERS, a strong town of France in Champagne, with a citadel. It was besieged with a powerful army by Charles V. who was obliged to raise the siege in 1521. It is seated on the river Mease, partly upon a hill, and partly in a valley, in E. Long. 3. 48. N. Lat. 49. 46.

MEZIRIAC (Claude Gaspar Backet Sieur de), one of the most ingenious men of the 17th century, was born at Bresse, of an ancient and noble family. He was a good poet in French, Italian, and Latin; an excellent grammarian, a great Greek scholar, and an admirable critic. He was well versed in the controversies, both in philosophy and religion; and was deeply skilled in algebra and geometry, of which last he gave proof by publishing the six books of Diophantes, enriched with a very able Commentary and Notes. In his youth he spent a considerable time at Paris and at Rome: at which last place he wrote a small collection of Italian poems, in competition with Vaugelas, who was there at the same time; among which there are imitations

imitations of the most beautiful similies contained in the eight first books of the Æneid. He also translated Ovid's Epistles; a great part of which he illustrated with very curious Commentaries of his own. While he was at Paris, they talked of making him preceptor of Louis XIII.: upon which he left the court in great haste, and afterwards declared that he had never felt so much pain upon any occasion of his life; for he seemed to have already upon his shoulders the important weight of the whole kingdom. He undertook the translation of all Plutarch's works, with notes; which he had brought nearly to a conclusion, when he died at Bourg, in Bresse, anno 1638, at 45 years of age. He left behind him several finished works, that were not printed

MEZUZOTH, in the Jewish customs, certain pieces of parchment which the Jews fix to the door-posts of their houses, taking that literally which Moses commands them, saying, "Thou shalt never forget the laws of thy God, but thou shalt write them upon the posts of thy house, and on thy gates." This expression means nothing else, but that thou shalt always remember them, whether thou comest into thy house or goest out. But the Hebrew doctors imagined, that the lawgiver meant something more than this. They pretended, that, to avoid making themselves ridiculous, by writing the commandments of God without their doors, or rather to avoid exposing themselves to the profanation of the wicked, they ought at least to write them on a parchment, and to enclose it in something. Therefore they wrote these words upon a square piece of parchment prepared on purpose, with a particular ink, and a square kind of character. Deut. vi. 4, 5, 6, 7, 8, 9. "Hear, O Israel, the Lord our God is one Lord, &c."—Then they left a little space, and afterwards went on, Deut. xi. 13. "And it shall come to pass, if thou shalt hearken diligently to my commandments, &c." as far as, "Thou shalt write them upon the door-posts of thy house, &c." After this they rolled up the parchment, and put it into a case of reeds or other matter; they wrote on the end of the case the word *Shadai*, which is one of the names of God; and they put it at the doors of their houses, chambers, and all places most frequented; they fixed it to the knockers of the door, on the right side; and as often as they entered in or went out they touched it in this place, with the end of their finger, which they afterwards kissed out of devotion. The Hebrew word *mezuza* properly signifies the door-posts of a house; but it is also given to this roll of parchment now mentioned.

MEZZOTINTO, a particular manner of representing figures on copper, so as to form prints in imitation of painting in Indian ink. See ENGRAVING.

The invention of this art has been usually attributed to prince Rupert. But Baron Heinikin, a very judicious and accurate writer upon the subject of engraving, asserts, with great appearance of truth, that it was a lieutenant-colonel de Siegan, an officer in the service of the landgrave of Hesse, who first engraved in this manner; and that the print which he produced was a portrait of the princess Amelia Elizabeth of Hesse, engraved in the year 1643. Prince Rupert learned the secret from this gentleman, and brought it into England when he came over the second time with Charles II. Prince Rupert's print of An Executioner holding a Sword in one Hand and a Head in the other, a half length, from Spagnoletto, is dated 1658. This art has never been cultivated with success in any country but England

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The prince laid his grounds on the plate with a channelled roller; but one Sherwin, about the same time, laid his grounds with a half-round file, which was pressed down with a heavy piece of lead. Both these grounding tools have been laid aside for many years; and a hand tool, resembling a shoemaker's cutting-board-knife, with a fine crenelling on the edge, was introduced by one Edial, a smith by trade, who afterwards became a mezzotinto painter.

It is very different from the common way of engraving. To perform it, they rake, hatch, or punch, the surface of the plate all over with a knife, or instrument made for the purpose, first one way, then the other, across, &c. till the surface of the plate be thus entirely furrowed with lines or furrows, close and as it were contiguous to each other; so that, if an impression was then taken from it, it would be one uniform blot or smut. This done, the design is drawn or marked on the same face; after which, they proceed with burnishers, scrapers, &c. to expunge and take out the dents or furrows, in all the parts where the lights of the piece are to be; and that more or less as the lights are to be stronger or fainter; leaving those parts black which are to represent the shadows or deepenings of the draught.

As it is much easier to scrape or burnish away parts of a dark ground corresponding with the outline of any design sketched upon it, than to form shades upon a light ground by an infinite number of hatches, strokes, and points, which must all terminate with exactness on the outline, as well as differ in their force and manner; the method of scraping, as it is called, in mezzotinto, consequently becomes much more easy and expeditious than any other method of engraving. The instruments used in this kind of engraving are cradles, scrapers, and burnishers.

In this engraving, the plate must be prepared and polished in the same manner as for other engraving; and afterwards divided equally by lines parallel to each other, and traced out with very soft chalk.—The distance of these lines should be about one-third of the length of the face of the cradle which is to be used, and these lines should be marked with capital letters, or strokes of the chalk. The cradle is then to be placed exactly betwixt the two first lines, and passed forwards in the same direction; being kept as steady as possible, and pressed upon with a moderate force. The same operation must be repeated with respect to all the other lines; till the instrument has thus passed over the whole surface of the plate.—Other lines must be then drawn from the extremities of the other two sides, in the same manner; which, intersecting the first at right angles, will with them form squares; and the same operation must be repeated with the cradle as in the case of the first. New lines must then be drawn diagonally, and the cradle passed betwixt them as before; and when the first diagonal operation is performed, the lines must be crossed at right angles as the former, and the

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cradles paſſed betwixt them in the ſame manner.—The plate having undergone the action of the cradle, according to the diſpoſition of the firſt order of lines, a ſecond ſet muſt be formed, having the ſame diſtances from each other as the firſt. But they muſt be ſo placed as to divide thoſe already made into ſpaces one-third leſs than their whole extent; *i. e.* every one after the firſt on each ſide will take in one-third of that before it, *e. g.* beginning at A, of which the firſt third muſt be left out; a third of B will conſequently be taken in, and ſo of the reſt. Theſe lines of the ſecond order muſt be marked with ſmall letters, or leſſer ſtrokes to diſtinguiſh them from the firſt: and the ſame treatment of the plate muſt be purſued with reſpect to them as was practiſed for the others. When this ſecond operation is finiſhed, a third order of lines muſt be made; the firſt of which, *e. g.* in A, muſt omit two-thirds of it, and conſequently take in two-thirds of B, &c. By theſe means, the original ſpaces will be exactly divided into equal thirds; and the cradle muſt be again employed betwixt theſe lines as before.—When the whole of this operation is finiſhed, it is called *one turn*; but in order to produce a very dark and uniform ground, the plate muſt undergo the repetition of all theſe ſeveral operations for above twenty times; beginning to paſs the cradle again betwixt the firſt lines, and proceeding in the ſame manner through all the reſt. When the plate is prepared with a proper ground, the ſketch muſt be chalked on it, by rubbing the paper on the backſide with chalk. It is alſo proper to overtrace it afterwards with black lead or Indian ink. The ſcraping is then performed, by pairing or cutting away the grain of the ground in various degrees; ſo that none of it is left in the original ſtate except in the touches of the ſtrongeſt ſhade. The general manner of proceeding is the ſame as drawing with white upon black paper. The maſſes of light are firſt begun with; and thoſe parts which go off into light in their upper part but are brown below: the reflections are then entered upon; after which the plate is blackened with a printer's blacking-ball made of felt, in order to diſcover the effect: and then the work is proceeded with; obſerving always to begin every part in the places where the ſtrongeſt lights are to be.

The art of ſcraping mezzotintoes has been applied to the printing with a variety of colours, in order to produce the reſemblance of paintings. The inventor of the method of doing this was J. C. Le Blon, a native of Frankfort, and pupil of Carlo Marata, between the years 1720 and 1730. It was eſtabliſhed by the inventor on this principle, that there are three primitive colours, of which all the reſt may be compoſed by mixing them in various proportions; that any two of theſe colours being mixed together, preſerve their original power, and only produce a third colour ſuch as their compound muſt neceſſarily give; but if tranſparent colours be mixed, and three primitive kinds compounded together, they deſtroy each other, and produce black, or a tendency to it, in proportion to the equality or inequality of the mixture; and that if, therefore, theſe three colours be laid, either ſeparately or upon each other, by three plates, engraved correſpondently on theſe principles to the colouring of the deſign, the whole variety of teints neceſſary may be produced. The requiſites, therefore, to the execution of any deſign in this method of printing are as follow: 1. To ſettle a plan of the colouring to be imitated; ſhowing where the preſence of each of the three ſimple colours is neceſſary, either in its pure ſtate or combined with ſome other, to produce the effect required; and to reduce this plan to a painted ſketch of each, in which not only the proper outlines, but the degree of ſtrength, ſhould be expreſſed. 2. To engrave three plates according to this plan, which may print each of the colours exactly in the places where, and proportion in which, they are wanted. 3. To find three tranſparent ſubſtances proper for printing with theſe three primitive colours. The manner in which Mr Le Blon prepared the plates was as follows: The three plates of copper were firſt well fitted with reſpect to ſize and figure to each other, and grounded in the ſame manner as thoſe deſigned for mezzotinto prints: and the exact place and boundary of each of the three primitive colours, conformably to the deſign, were ſketched out on three papers, anſwering in dimenſions to the plate. Theſe ſketches were then chalked on the plates; and all the parts of each plate that were not to convey the colour to which it was appropriated to the print, were entirely ſcraped away, as in forming the light of mezzotinto prints. The parts that were to convey the colours were then worked upon; and where the moſt light or diluted teints of the colour were to be, the grain in the ground was proportionably taken off; but where the full colour was required, it was left entire. In this regard was had, not only to the effects of the colour in its ſimple ſtate, but to its combined operation, either in producing orange-colour, green, or purple, by its admixture with one alone; and likewiſe to its forming brown, grey, and ſhades of different degrees, by its co-operation with both the others. But though the greateſt part of the engraving was performed in the mezzotinto manner, yet the graver was employed occaſionally for ſtrengthening the ſhades, and for correcting the outline where it required great accuracy and ſteadineſs. It was found neceſſary ſometimes to have two ſeparate plates for printing the ſame colour, in order to produce a ſtronger effect: but the ſecond plate, which was uſed to print upon the firſt, was intended only to glaze and ſoften the colours in particular parts that might require it. With reſpect to the black and brown teints, which could not be ſo conveniently produced in a due degree by the mixture of the colours, umber and black were likewiſe uſed.

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With reſpect to the order in which the plates are to be applied, it may be proper to obſerve, that the colour which is leaſt apparent in the picture ſhould be laid on firſt; that which is betwixt the moſt and leaſt apparent next; and that which predominates laſt; except where there may be occaſion for two plates for the ſame colour, as was before-mentioned; or where there is any required for adding browns and ſhades.

Mr Le Blon applied this art to portraits, and ſhowed, by the ſpecimens he produced, the poſſibility of its being brought, by farther improvements, to afford imitations of painting which might have ſome value. It is nevertheleſs much better adapted to the ſimpler ſubjects,

subjects, where there are fewer intermixtures of colours; and where the accuracy of the reflections, and demi-teints, are not so effentially neceffary to the truth of the defign, from the greater latitude of form, and difpofition of the colour, as in plants, anatomical figures, and fome fubjects of architecture. But perhaps plates engraved or rather finifhed with the tool, particularly with refpect to the outline, would be better accommodated in fome of thefe cafes than thofe prepared only by fcraping.

Mr Cochin remarks, at the end of an account he has given of Mr Le Blon's manner, that though this ingenious artift confined his method principally to the ufe of three colours; yet, fhould this invention be again taken up and cultivated, there would be more probability of fuccefs in ufing a greater variety: and that feveral different kinds might be printed by one plate; provided they were laid on in their refpectively proper places by printing-balls, which fhould be ufed for that colour only. His hint might however be very greatly improved, by the further affiftance of pencils, accommodated to the plates, for laying on the colours in the proper parts.—For the method of taking off mezzotinto prints on glafs, fee *Back-painting*.

MIASMA, among phyficians, a particular kind of effluvia, by which certain fevers, particularly intermittents, are produced.

MICA, Daze, *Talc*, *Mufcovy-glafs*, *Glimmer*, or *Glift*; a genus of magnefian earths, known by the following characters: 1. They confift of thin flexible particles, divifible into plates or leaves, having a fhining furface. 2. Thefe leaves or fcales, expofed to the fire, lofe their flexibility and become brittle, feparating afterwards into thinner leaves: but in a quick and ftrong fire they curl or crumple, which is a ftep towards fufion; though it is very difficult to reduce them into pure glafs without addition. 3. They melt eafily with borax, the microcofmic falt, and alkaline falt; and, by means of the two former falts, may be brought to a clear glafs before the blow-pipe. That which contains iron, however, is more fufible than the uncoloured earths of this kind. No loofe or friable mica has yet been difcovered, but all of an indurated kind. Its fpecific gravity, according to Fabroni, is about 3000. Kirwan tells us, that the fpecific gravity of this fubftance, when it contains much iron, is from 2535 to 3000. An hundred parts of the colourlefs kind contain 38 of filex, 28 of argill, 20 of magnefia, and 14 of the moft dephlogifticated calx of iron. Martial mica contains alfo 10 or 12 *per cent.* of a more phlogifticated calx of iron; whence its various colours are derived, and a proportionably fmaller quantity of the other ingredients. The fpecies are,

I. Mica alba, colourlefs or pure mica; of which there are the following varieties. 1. Mufcovy glafs, confifting of large parallel plates, and as tranfparent as glafs, found in Siberia and Sweden. This differs externally from the common talc, in being more foapy to the touch. An hundred parts of it contain 50 of filex, 45 of mild magnefia, and 5 of argill or clay. Venetian talc is white, grey, yellowifh, or greenifh, and femitranfparent. It is much more tender and brittle than mica, and fo foft that it may be fcratched with the nail. Its fpecific gravity is 2729. 2. Mica fquamofa, compofed of fmall plates, found in Sweden and other countries of Europe. 3. Compofed of fine particles like chaff. 4. Talcum officinale, crumpled mica, compofed of crumpled plates. Mica.

II. Mica colorata martialis, coloured and martial glimmer. Of this there are many varieties. 1. Brown and femitranfparent, found in Lapland. 2. Confifting of fine and minute fcales, of a brown, deep-green, light-green, or black colour, found in different parts of Sweden. 3. Twifted or crumpled glimmer, of a light green colour, found alfo in Sweden. 4. Chaffy glimmer, of a black colour, found in the ftone called *hornberg*, occurring in moft of the Swedifh copper mines, as at Norberg, Flodberg, &c. 5. Cryftallized glimmer, with erect fcales, or with hexagonal horizontal plates, found alfo in Sweden.

Moft of thefe ftones are fuppofed abfolutely to refift the fire; but this is to be underftood only of certain degrees of heat, and when they are mixed with certain bodies. Cronftedt obferves, however, that they may with equal propriety be called *vitrefcent*; becaufe they melt with that degree of heat in which neither quartz nor limeftone are in the fmalleft degree altered. They are ftill more readily melted when either naturally or artificially combined with a martial earth. Hence fome ores, though much mixed with mica, may be very readily melted; while others, in which the fame fubftance is mixed with quartz, it may be impoffible to melt; becaufe the mica renders the quartz fo compact as to prevent it from cracking. It does the fame with an apyrous clay, which is the reafon why the lapis ollaris refifts the fire fo ftrongly.

M. Margraaf afferts, that he has obtained Epfom falt from talc; and Mr Fabroni informs us, that in decompofing nitre by means of a micaceous fubftance, as foon as the acid is diftilled there rifes fome other fubftance hitherto unknown at the end of the operation: he adds, that on employing aqua regia or marine acid to diffolve this fubftance, the yellow colour which refults from the folution fhows that it contains fome iron. This laft affertion is confirmed by M. Monnet, who found that phlogifticated alkali and folution of galls produce a bluifh colour with that of mica. He adds, that its component parts are the fame with thofe of afbeftos, excepting only that the latter contains more iron.

Cronftedt informs us, that the martial mica acquires a fhining yellow colour in a calcining heat, which has induced many to examine it in hopes of finding gold; though no metal can be obtained from it except iron, which may be diffolved by means of aqua regia. A late German author indeed has pretended, that he produced from mica an unknown femimetal which refembled iron mixed with zinc. He owned, however, that he made ufe of a flux compofed of feveral metals, fome of which probably united with the talc, and thus deceived him. The talc cubes, which are micaceous bodies of the figure of aluminous cryftals, are much valued and fought after by fome mineralogifts. They are met with in fome parts of Sweden; and when broken are found to confift of an iron ore frequently mixed with a marcafitical copper ore, and are only covered with a very thin coat of mica. The broad and tranfparent talc named *Mufcovy-glafs* is ufed inftead of glafs for windows; and has this advantage above common glafs, that it refifts the explofion of cannon. Cronftedt thinks that it might be advantageoufly ufed for covering houfes. The twifted or crumpled mica, found in fome places of Sweden, is manufactured into kettles and other veffels, likewife into hearths for chimneys; "and the powder which falls in the working (fays our author) may be mixed with the common falt for the diftillation of the muriatic acid."

According to M. Magellan, many mineral fubftances may have the glittering appearance of talc without really belonging to that genus. An artificial production of this kind he happened to obferve in Mr Wedgewood's work It was an unexpected refult from vitriol calcined to rednefs, then mixed without being wafhed with common falt. It now underwent a fecond calcination under a muffle, with a heat fomewhat ftronger; about the tenth degree of his thermometer. The colour was of a dark purple, and the fhining particles fo bright as to fhow their glaffy form, very different from true mica.

MICAH, or *The Book of Micah*, a canonical book of the Old Teftament, written by the prophet Micah, who is the feventh of the twelve leffer prophets. He is cited by Jeremiah, and prophefied in the days of Jotham, Ahaz, and Hezekiah. He cenfures the reigning vices of Jerufalem and Samaria, and denounces the judgments of God againft both kingdoms. He likewife foretels the confufion of the enemies of the Jews, the coming of the Meffiah, and the glorious fuccefs of his church.

MICHAEL, or Michel, (i. e. *who is like to God?*) The fcripture account of Michael is, that he was an archangel, who prefided over the Jewifh nation, as other angels did over the Gentile world, as is evident of the kingdoms of Perfia and Greece, (Dan. x. 13.); that he had an army of angels under his command (Rev. xii. 7.); that he fought with the Dragon, or Satan and his angels; and that, contending with the Devil, he difputed about the body of Mofes, (Jude 9.) As to the combat between Michael and the Dragon, fome authors underftand it literally, and think it means the expulfion of certain rebellious angels, with their head or leader, from the prefence of God. Others take it in a figurative fenfe; and refer it, either to the conteft that happened at Rome between St Peter and Simon Magus, in which the apoftle prevailed over the magician, or to thofe violent perfecutions under which the church laboured for three hundred years, and which happily ceafed when the powers of the world became Chriftians. Among the commentators who maintain the former opinion is Grotius; and among thofe who take it in a figurative fenfe are Hammond and Mede.

The conteft about the body of Mofes is likewife taken both literally and figuratively. Thofe who underftand it literally are of opinion, that Michael by the order of God hid the body of Mofes after his death; and that the Devil endeavoured to difcover it, as a fit means to entice the people to idolatry, by a fuperftitious worfhip of his relics. But this difpute is figuratively underftood to be a controverfy about rebuilding the temple, and reftoring the fervice of God among the Jews at Jerufalem; the Jewifh church being fitly enough ftyled the body of Mofes. It is thought by fome, that this ftory of the conteft between Michael and the Devil was taken by St Jude out of an apocryphal book called, *The Affumption of Mofes*.

The Romifh church celebrates three appearances of Michael, of which no mention is made in fcripture, and which have happened, they fay, a long time after the age of the apoftles. The firft appearance of this archangel was at Coloffæ in Phrygia, but at what time is uncertain. The fecond is that of mount Garganus, in the kingdom of Naples, about the end of the fifth century. The third is his appearance to Aubert bifhop of Avranches, upon a rock called the *Tomb*, where at this day is the abbey of St Michael. This was about the year 706. The firft of thefe feftivals is obferved on the 6th of September, the fecond on the 8th of May, and the laft on the 16th of October. It has been fuppofed, that it was Michael the archangel who conducted the Ifraelites in their journey through the wildernefs, (fee Ex. xxxii. 20, 23, and xxxiii. 2.); that it was he who appeared to Mofes in the burning bufh; who appeared to Jofhua in the fields of Jericho, and to Gideon and Manoah the father of Samfon; and, in a word, to him have been imputed the greateft part of the moft remarkable appearances either in the Old or New Teftament.

Michael Angelo. See Angelo.

Mount Michael, one of the moft celebrated ftate-prifons of France, lies about 20 miles from Granville. It is a rock fituated in the middle of the bay of Avranches; and is only acceffible at low water. Nature has completely fortified one fide, by its craggy and almoft perpendicular defcent, which renders it impracticable to mount it by any addrefs or courage, however confummate. The other parts are furrounded by walls fenced with femilunar towers after the Gothic manner; but fufficiently ftrong, together with the advantage of its fituation, to render it impregnable to any attack. At the foot of the mountain begins a ftreet or town, which winds round its bafe to a confiderable height. Above are chambers where ftate-prifoners are kept, and where there are other buildings intended for refidence. On the fummit is erected the abbey itfelf, occupying a prodigious fpace of ground, and of a ftrength and folidity equal to its enormous fize; fince it has for many centuries withftood all the injuries of the weather, to which it is fo much expofed. In an apartment, called the *Sale de Chavalerie*, the knights of St Michael ufed to meet in folemn convocation on important occafions. They were the defenders and guardians of this mountain and abbey, as thofe of the temple, and of St John of Jerufalem, were of the holy fepulchre. The hall in which they met is very fpacious, but rude and barbarous. At one end is a painting of the archangel, the patron of their order; and in this hall Louis XI. firft inftituted and invefted with the infignia of knighthood the chevaliers of the crofs of St Michael. There is a miferable dark apartment, or rather dungeon, in which many eminent perfons were formerly confined. In the middle of it is a cage, compofed of prodigious bars of wood; and the wicket which gives entrance into it is 10 or 12 inches in thicknefs. The infide of it comprifes about 12 or 14 feet fquare, and it is nearly 20 in height. Towards the latter end of the laft century, a certain newfwriter in Holland, who had prefumed to print fome very severe and sarcastic reflections on Madame de Maintenon, was confined in this place. Some months after his publication, he was induced, by a person sent expressly for that purpose, to make a tour into French Flanders. The moment he had quitted the Dutch territories, he was put under arrest; and immediately, by his majesty's express command, conducted to Mount Michael, where he was shut up in this cage. Here he lived upwards of 23 years; and here he at length expired. During the long nights of winter, no candle or fire was allowed him. He was not permitted to have any book. He saw no human face, except the gaoler, who came once every day to present him, through a hole in the wicket, with his little portion of bread and wine. No instrument was given him with which he could destroy himself: but he found means at length to draw out a nail from the wood, with which he engraved, or cut on the bars of his cage, certain fleurs de lis and armorial bearings, which formed his only employment and recreation. They are very curiously performed considering the rudeness of his tool.

The subterraneous chambers in this mountain are said to be so numerous, that the gaolers themselves do not know them. There are certain dungeons called *oublieттes*, into which they were accustomed anciently to let down malefactors guilty of very heinous crimes: they provided them with a loaf of bread and a bottle of wine, and then they were totally forgotten, and left to perish by hunger in the dark vaults of the rock. This punishment, however, has not been inflicted by any king in the last or present century.

Here also is a remarkable chamber, in one corner of which is a kind of window: between this and the wall of the building is a very deep space, of near 100 feet perpendicular, at the bottom of which is another window opening to the sea. It is called the *Hole of Montgomeri;* and the history of it is as follows: In the year 1559, Henry II. king of France was unfortunately killed at a tournament by the count de Montgomeri †. He was a Huguenot; and having escaped the massacre of Paris, made head against the royal forces in Normandy, supported by queen Elizabeth with arms and money. Being driven from his fortresses in these parts, he retired to a rock called the *Tombelaine.* This is another similar to Mount Michael; only three quarters of a league from it, and of nearly equal dimensions. At that time there was a castle upon it, which has since been demolished, and of which scarce any vestiges now remain. From this fortress, accessible only at low-water, he continually made excursions, and annoyed the enemy, who never dared to attack him. He coined money, laid all the adjacent country under contribution, and rendered himself universally dreaded. Desirous, however, to surprise Mount Michael, he found means to engage one of the monks resident in the abbey; who promised to give him the signal for his enterprise by displaying a handkerchief. The monk having made the signal, betrayed him, and armed all his associates, who waited Montgomeri's arrival. The chieftain came, attended by 50 chosen soldiers, all desperate, and capable of any attempt. They crossed the sand; and having placed their scaling-ladders, mounted one by one. As they came to the top, they were dispatched, each in turn, without noise. Montgomeri, who followed last, discovered the perfidy, and escaped with only two of his men, with whom he regained the Tombelaine. They preserve with great care the ladders and grappling irons used on this occasion. The count was at last besieged and taken prisoner by the mareshal de Matignon, in 1574, at Domfront, in Normandy; and Catharine de Medicis, who hated him for having been, though innocently, the cause of her husband's death, caused him to be immediately executed.

Michael, St Michael's.

The church of Mount Michael is a great curiosity. It stands on nine pillars of most enormous dimensions, built on the solid rock. Each of them appears to be about 25 feet in circumference: besides these, there are two others much inferior in size, on which the centre of the church rests, and over which is the tower. The following is the legendary account of the origin of this church: In the reign of Childebert II. there was a bishop of Avranches named *St Aubert.* To this holy man the archangel Michael was pleased to appear one night, and ordered him to go to this rock to build a church. St Aubert treated this as a dream; upon which the angel appeared a second time; and being still disobeyed, he returned a third time, when, by way of imprinting his command upon the saint's memory, he made a hole in his skull, by touching it with his thumb. The skull is still preserved in the treasury of the church. It is inclosed in a little shrine of gold, and a crystal, which opens over the orifice, admits the gratification of curiosity by the minutest examination of it. The hole is of a size and shape proportionable to the thumb said to have produced it; but it is impossible to determine whether it has been really made by a knife or any other way. It is not to be supposed that the saint would forget such a sensible mark of the angel's displeasure; he therefore immediately repaired to the rock, and constructed a small church, as he had been commanded. Here, however, true history supplies the place of fable; and informs us, that it was in 96› when Richard the second duke of Normandy began to build the abbey. It was completed about the year 1070, under William the Conqueror, though many other additions were made by succeeding abbots.

In the treasury of the church are innumerable other relics; among which some few have a real and intrinsic value. There is a fine head of Charles VI. of France, cut in a crystal, and the representation of a cockle-shell in gold, weighing many pounds, given by Richard II. duke of Normandy, when he founded the abbey. There is an arm said to belong to *St Richard* king of England; but who this saint was it must be very difficult to determine.

St MICHAEL'S, a borough town of Cornwal, between St Columb and Truro, 247 miles from London. Though one of the oldest boroughs in the county by prescription, and of great note in the Saxons time, it is a mean hamlet in the parishes of Newland and St Enidore; yet it is governed by a portreeve, yearly chosen by a jury of the chief inhabitants, out of the six chief tenants, called deputy lords of the manor, because they hold lands in the borough. Here is no market, but two fairs. A court-leet is held here twice a year. This place was formerly called Modishole, and afterwards Michel. Its list of members begins in the 6th of Edward VI.

St Michael's Mount, in the county of Cornwal, in the corner of Mount's-Bay, is a very high rock, Michaelis.

only divided by the tide from the main-land, so that it is land and island twice a-day. The town here was burnt by the French in the reign of king Henry VIII. At the bottom of this mount, in digging for tin, there have been found spear-heads, battle axes, and swords, of brass, all wrapt up in linen. The county is contracted here into a sort of isthmus, so that it is scarce four miles between the Channel and the Severn sea.—There have been large trees driven in by the sea between this mount and Penzance.

MICHAELIS (John David), a celebrated biblical critic, and author of many esteemed works, was the eldest son of Dr Christian Benedict Michaelis, professor in the university of Halle in Lower Saxony, and was born at that place Feb. 27. 1717. His father devoted him at an early age to an academical life; and with that view he received the first part of his education in a celebrated Prussian seminary, called the *Orphan-house*, at Glanche, in the neighbourhood of his native place. He commenced his academical career at Halle in 1733, and took his master's degree in the faculty of philosophy in 1739. In 1741 he made an excursion to this country, where his superior knowledge of the oriental languages, which was considerably increased by his indefatigable researches in the Bodleian library at Oxford, introduced him to the acquaintance, and gained him the esteem, of our first literary characters; with several of whom, and particularly bishop Lowth, he was in correspondence for many years. On his return to Halle, after an absence of fifteen months, he began to read lectures on the historical books of the Old Testament, which he continued after his removal to Gottingen in 1745. In 1746 he was appointed professor extraordinary, and soon after professor of philosophy, in that university. The next year he obtained a place of secretary to the royal society there, of which he was director in 1761, and was soon afterwards made Aulic counsellor by the court of Hanover. In 1764 his distinguished talents, but chiefly a publication relative to a journey to Arabia, which was undertaken by several literary men, at the expence of the king of Denmark, in consequence of his application by means of Count Bernsdorff, procured him the honour of being chosen a correspondent, and afterwards foreign member, of the academy of inscriptions at Paris, of whom the institution admitted only eight; and in the same year he became a member of the society of Haarlem. In 1775, Count Hopkin, who eighteen years before had prohibited the use of his writings at Upsal, when he was chancellor of that university, prevailed upon the king of Sweden to confer on him the order of the polar star, as a national compensation. In 1786 he was raised to the distinguished rank of privy counsellor of justice by the court of Hanover; and in 1788 received his last literary honour, by being unanimously elected a fellow of the royal society of London.—His great critical knowledge of the Hebrew language, which he displayed in a new translation of the Bible, and in other works, raised him to a degree of eminence almost unknown before in Germany; and his indefatigable labours were only equalled by his desire of communicating the knowledge he acquired to the numerous students of all countries who frequented his admirable lectures, which he continued to deliver on various parts of the sacred writings in half-yearly courses, and on the Hebrew, Arabic, and Syriac languages, to the last year of his life. He was professor in the university of Gottingen forty-five years, and, during that long period, he filled the chair with dignity, credit, and usefulness. He died October 22. 1791, aged 74. He is said to have left behind him several valuable MSS. Of the works that were published during his life time, and which are very numerous, a catalogue, in the order of their publication, is given in the *Gentleman's Magazine* for March 1792.

Michaelmas, Mickle.

MICHAELMAS, or *Feast of St* MICHAEL *and all Angels*, a festival of the Christian church, observed on the 29th of September. See MICHAEL.

MICKLE (William Julius), the celebrated translator of the Lusiad, was the son of the reverend Alexander Mickle a Scottish clergyman, who had formerly been a dissenting minister in London, an assistant to the reverend Dr Watts, and one of the translators of Bayle's Dictionary. This gentleman having resided a few years in London, was presented to the church of Langholm near Kelso in Scotland, where he married; and our author was one of the younger sons. He was born about the year 1735, and was educated by his father. In his early years his passion for poetry frequently discovered itself; though till the age of 13 he did not show any particular attachment to books. At that time having accidentally met with Spencer's Fairy Queen, he became enamoured of his manner of writing, and instantly began to imitate him. After the death of his father, he came to Edinburgh to reside with an uncle who was a brewer there, and who admitted him into a share of his business; but not being qualified to succeed in this line, he went to London about the time of the conclusion of the war which began in 1755, with a view to procure a commission in the marine service. Here he was disappointed; but introduced himself to the first Lord Lyttelton, to whom he sent one of his poems. From his lordship, however, he received no other favour than being admitted to several interviews, and encouraged to persevere in his poetical plans.

So closely did our author cultivate the study of the muses, that before he was 18 years of age he had written two tragedies and half an epic poem; but all these were committed to the flames. The first of his poems which appeared in print was published in one of the Edinburgh magazines, and intitled, "On passing thro' the Parliament Close of Edinburgh at Midnight." This was afterwards inserted in A Collection of Original Poems by a Scotch gentleman, Vol. II. p. 137.

From the time of Mr Mickle's arrival at London till the year 1765, it is not known how he employed his time, though it is probable that he was employed in some branch of the printing business; and in 1765 he engaged himself as corrector to the Clarendon press. This year he published the poem which first brought him into notice, intitled, "Pollio, an Elegiac Ode, written in the Wood near R—— (Roslin) Castle," 4to. This was an elegy written on the death of his brother; which, previous to its publication, had been shown to Lord Lyttelton, and received some corrections from him. The latter, in an epistle to the author, spoke of it as equal to any thing of the kind in our language. In 1767 he published a poem called "The Concubine, in two Cantos, after the manner of Spencer,"

Fig. 1.

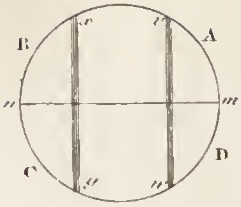
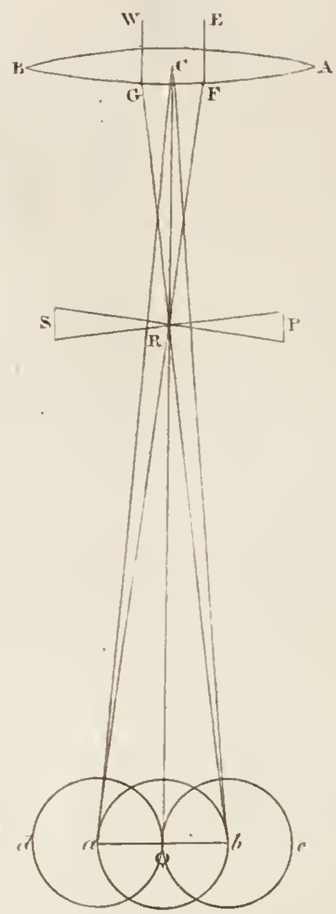


Fig. 3.

Fig. 8.



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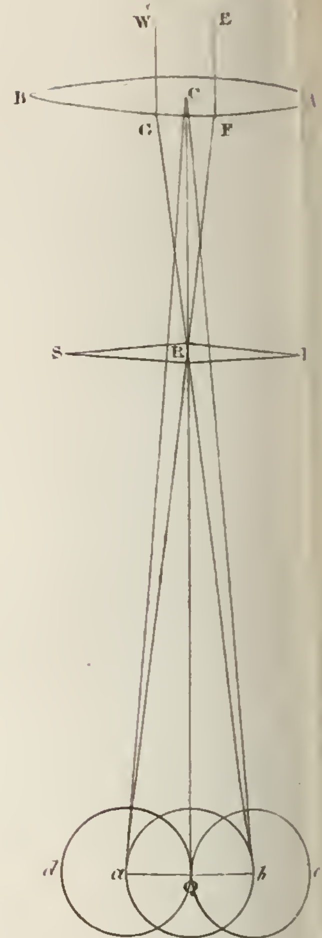

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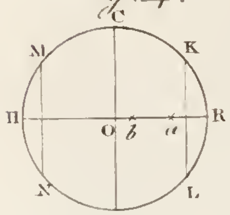

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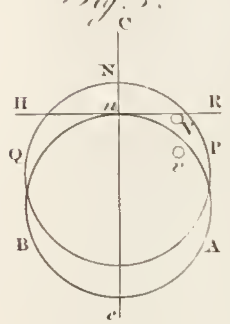

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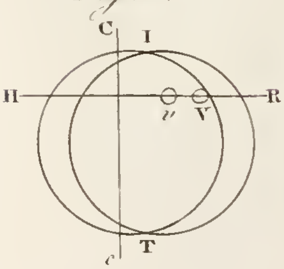

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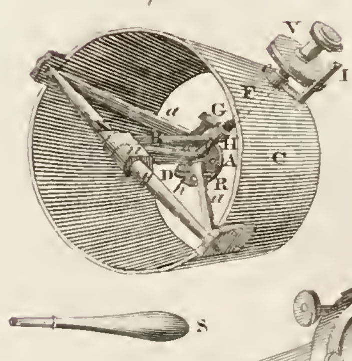
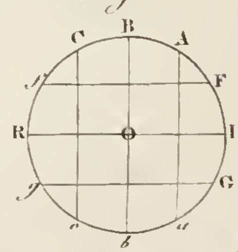


Fig. 2.



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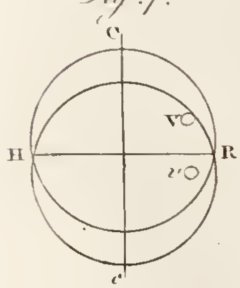


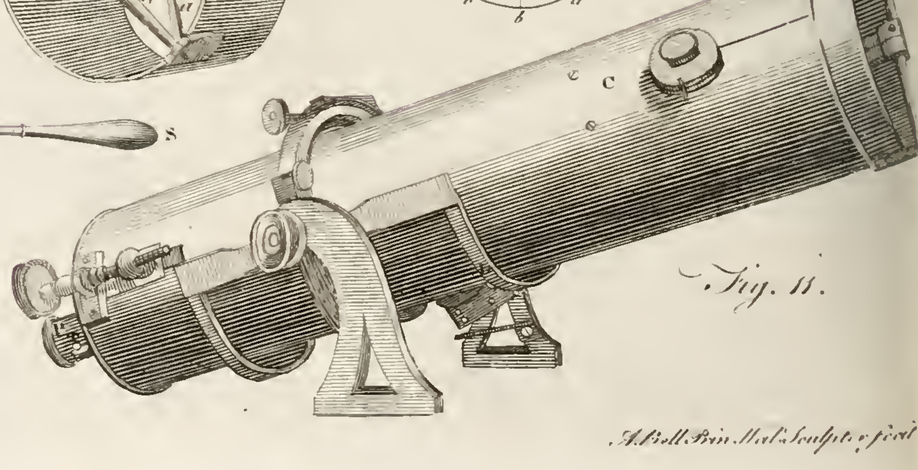


Fig. 11.

A. Bell Prin. Mal. Sculpt. fecit.

Spencer," 4to; and in 1769 he published, "A Letter to Mr Harwood, wherein some of his evasive Glosses, false Translations, and blundering Criticisms, in support of the Arian Heresy, contained in his Literal Translation of the New Testament, are pointed out and confuted," 8vo: and next year he published "Mary Queen of Scots, an Elegy;" "Hengist and Mary, a Ballad;" and "Knowledge, an Ode;" in Pearch's Collection of Poems. In 1770 he published "Voltaire in the Shades, or Dialogues on the Deistical Controversy," 8vo. The Elegy on Mary had been submitted to the judgment of Lord Lyttelton, who declined to criticise it, not for its deficiency in poetical merit, but from thinking differently from the author concerning that unfortunate princess.

About this time Mr Mickle was a frequent writer in the Whitehall Evening Post; but a more important work now engaged his attention. When no more than 17 years of age he had read Castara's translation of the Lusiad of Camoens into French, and then projected the design of giving an English translation of it. From this, however, he was prevented by various avocations till the year 1771, when he published the first book as a specimen: and having prepared himself by acquiring some knowledge of the Portuguese language, he determined to apply himself entirely to this work. With this view he quitted his residence at Oxford, and went to a farm-house at Forest-hill, where he pursued his design with unremitting assiduity till the year 1775, when the work was entirely finished.

During the time that Mr Mickle was engaged in this work, he subsisted entirely by his employment as corrector of the press; and on his quitting that employment he had only the subscriptions he received for his translation to support him. Notwithstanding these difficulties, he adhered steadily to the plan he had laid down, and completed it in about five years.

When his work was finished, Mr Mickle applied to a person of great rank, with whom his family had been connected, for permission to dedicate it to him. Permission was granted, and his patron honoured him with a very polite letter; but after receiving a copy, for which an extraordinary price was paid for the binding, he did not think proper to take any notice of the author. At last a gentleman of high rank in the political world, a firm friend to the author, and who afterwards took him under his protection, waited on the patron, and heard him declare that he had not read the work, but that it had been represented not to have the merit it was at first said to possess. The applause with which the work was received, however, soon banished from the author's mind those disagreeable sensations which had been occasioned by the contemptuous neglect of his patron, as well as some severe criticisms which had been circulated concerning it. A second edition was prepared in 1778, with a plate prefixed to it, executed by the celebrated artist Mortimer; on whom Mr Mickle wrote an epitaph in 1779. This year also he published a pamplet, intitled, "A Candid Examination of the Reasons for depriving the East India Company of its Charter, contained in The History and Management of the East India Company from its Commencement to the Present Time; together with some Strictures on the Self-Contradictions and Historical Errors of Dr Adam Smith, in his Reasons for the Abolition of the said Company," 4to. About this time some of his friends thought of recommending him to the king as deserving of a pension; but this scheme was never put in execution. Dr Lowth, bishop of London, would have put him into orders, and provided for him in the church; but this was not agreeable to our author's disposition. While he was meditating a publication of all his poems, in which he would most probably have found his account, he was appointed secretary to Commodore Johnstone, who had lately obtained the command of the Romney man of war. In November 1779 he arrived at Lisbon, and was named by his patron joint agent for the prizes which were taken. In this capital and its neighbourhood he resided more than six months, being every where received with every mark of politeness and attention; and during this period he composed his poem called "Almada Hill," which in 1781 was published in quarto. He collected also many particulars concerning the manners of the Portuguese, which he intended also to have published. During his stay at Lisbon the royal academy was opened; and Mr Mickle, who was present at the ceremony of its commencement, had the honour to be admitted a member under the presidency of Don John of Braganza duke of Lafoens. His presence being thought necessary in England to attend to the proceedings of the courts of law respecting the condemnation of some of the prizes, he did not accompany the commodore in his last expedition, nor did he go any more to sea. In 1782 he published "The Prophecy of Queen Emma, an ancient Ballad lately discovered, written by Johannes Turgottus, prior of Durham, in the reign of William Rufus; to which is added by the Editor, an Account of the Discovery, and Hints towards a Vindication of the Authenticity, of the Poems of Ossian and Rowley," 8vo.

In June this year Mr Mickle married Miss Tomkins, daughter of the person with whom he resided at Forest-hill, while engaged in translating the Lusiad. Having received some fortune with this lady, as well as made some money himself when in the service of Commodore Johnstone, he now enjoyed a comfortable independence. Having fixed his residence at Wheatley in Oxfordshire, he devoted his time to the revision of his poetical works, which he proposed to publish by subscription; but the plan has not yet been carried into execution. The last seven years of his life were employed in writing for the European Magazine. The Fragments of Leo, and some of the most approved reviews of books, in that performance, were of his production. He died after a short illness on the 25th of October 1788 at Wheatley, leaving one son behind him. His poetry possesses much beauty, variety, harmony of numbers, and vigour of imagination: his life was without reproach; his foibles were few and inoffensive; his virtues many; and his genius very considerable.

MICROCOSM, a Greek term signifying the *little world;* used by some for *man*, as being supposed an epitome of the universe or great world.

MICROCOSMIC ACID. See PHOSPHORUS (*Acid of*).

Micrography, Micrometer.

MICROGRAPHY, the defcription of objects too minute to be viewed without the affiftance of a microfcope. See *Microscopic Objects*.

MICROMETER, an inftrument, by the help of which the apparent magnitudes of objects viewed thro' telefcopes or microfcopes are meafured with great exactnefs.

I. The firft TELESCOPIC micrometers were only mechanical contrivances for meafuring the image of an object in the focus of the object-glafs. Before thefe contrivances were thought of, aftronomers were accuftomed to meafure the field of view in each of their telefcopes, by obferving how much of the moon they could fee through it, the femidiameter being reckoned at 15 or 16 minutes; and other diftances were eftimated by the eye, comparing them with the field of view. Mr Gafcoigne, an Englifh gentleman, however, fell upon a much more exact method, and had a Treatife on Optics prepared for the prefs; but he was killed during the civil wars in the fervice of Charles I. and his manufcript was never found. His inftrument, however, fell into the hands of Mr R Townly, who fays, that by the help of it he could mark above 40,000 divifions in a foot.

Mr Gafcoigne's inftrument being fhown to Dr Hooke, he gave a drawing and defcription of it, and propofed feveral improvements in it, which may be feen in Phil. Tranf. abr. Vol. I. p 217. Mr Gafcoigne divided the image of an object, in the focus of the object-glafs, by the approach of two pieces of metal ground to a very fine edge, in the place of which Dr Hooke would fubftitute two fine hairs ftretched parallel to one another. Two other methods of Dr Hooke's, different from this, are defcribed in his Pofthumous Works, p. 497, 498. An account of feveral curious obfervations that Mr Gafcoigne made by the help of his micrometer, particularly in the menfuration of the diameters of the moon and other planets, may be feen in the Phil. Tranf. Vol. XLVIII. p. 190.

Mr Huygens, as appears by his Syftem of Saturn, publifhed in 1659, ufed to meafure the apparent diameters of the planets, or any fmall angles, by firft meafuring the quantity of the field of view in his telefcope; which, he fays, is beft done by obferving the time which a ftar takes up in paffing over it, and then preparing two or three long and flender brafs plates, of various breadths, the fides of which were very ftraight, and converging to a fmall angle. In making ufe of thefe pieces of brafs, he made them flide in two flits, that were made in the fides of the tube, oppofite to the place of the image, and obferved in what place it juft covered the diameter of any planet, or any fmall diftance that he wanted to meafure. It was obferved, however, by Sir Ifaac Newton, that the diameters of planets, meafured in this manner, will be larger than they fhould be, as all lucid objects appear to be when they are viewed upon dark ones.

In the Ephemerides of the Marquis of Malvafia, publifhed in 1662, it appears that he had a method of meafuring fmall diftances between fixed ftars and the diameters of the planets, and alfo of taking accurate draughts of the fpots of the moon; and this was by a net of filver wire, fixed in the common focus of the object and eye-glafs. He alfo contrived to make one of two ftars to pafs along the threads of this net, by turning it, or the telefcope, as much as was neceffary for that purpofe; and he counted, by a pendulum-clock, beating feconds, the time that elapfed in its paffage from one wire to another, which gave him the number of the minutes and feconds of a degree contained between the intervals of the wires of his net, with refpect to the focal length of his telefcope.

In 1666, Meffrs Azout and Picard publifhed a defcription of a micrometer, which was nearly the fame with that of the Marquis of Malvafia, excepting the method of dividing it, which they performed with more exactnefs by a fcrew. In fome cafes they ufed threads of filk, as being finer than filver wires. Dechales alfo recommends a micrometer confifting of fine wires, or filken threads, the diftances of which were exactly known, difpofed in the form of a net, as peculiarly convenient for taking a map of the moon.

M. de la Hire fays, that there is no method more fimple or commodious for obferving the digits of an eclipfe than a net in the focus of the telefcope. Thefe, he fays, were generally made of filken threads; and that for this particular purpofe fix concentric circles had alfo been made ufe of, drawn upon oiled paper; but he advifes to draw the circles on very thin pieces of glafs with the point of a diamond. He alfo gives feveral particular directions to affift perfons in the ufe of them. In another memoir he fhows a method of making ufe of the fame net for all eclipfes, by ufing a telefcope with two object-glaffes, and placing them at different diftances from one another.

Plate CCXC fig 1.

Different Conftructions of Micrometers. The firft we fhall defcribe is that by Mr Huygens. Let ABCD be a fection of the telefcope at the principal focus of the object-glafs, or where the wires are fituated, which are placed in a fhort tube containing the eye-glafs, and may be turned into any pofition by turning that tube; mn is a fine wire extended over its centre; vw, xy, are two ftraight plates whofe edges are parallel and well defined, and perpendicular to mn; vw is fixed, and xy moves parallel to it by means of a fcrew, which carries two indexes over a graduated plate, to fhow the number of revolutions and parts of a revolution which it makes. Now to meafure any angle, we muft firft afcertain the number of revolutions and parts of a revolution correfponding to fome known angle, which may be thus done: 1ft, Bring the inner edges of the plates exactly to coincide, and fet each index to 0; turn the fcrew, and feparate the plates to any diftance; and obferve the time a ftar m is in paffing along the wire mn from one plate to the other: for that time, turned into minutes and feconds of a degree, will be the angle anfwering to the number of revolutions, or the angle correfponding to the diftance. Thus, if d = cof. of the ftar's declination, we have $15' dm$, the angle correfponding to this diftance; and hence, by proportion, we find the angle anfwering to any other. 2dly, Set up an object of a known diameter, or two objects at a given diftance, and turn the fcrew till the edges of the plates become tangents to the object, or till their opening juft takes in the diftance of the two objects upon the wire mn: then from the diameter, or diftance of the two objects from each other, and their diftance from the glafs, calculate the angle, and obferve the number of revolutions and parts correfponding. 3dly, Take the diameter of the fun on any day, by making the edges of the plates tangents to the oppofite limbs, and find, from

from the nautical almanac, what is his diameter on that day. Here it will be best to take the upper and lower limbs of the sun when on the meridian, as he has then no motion perpendicular to the horizon. If the edges do not coincide when the indexes stand at 0, we must allow for the error. Instead of making a proportion, it is better to have a table calculated to show the angle corresponding to every revolution and parts of a revolution. But the observer must remember, that when the micrometer is fixed to telescopes of different focal lengths, a new table must be made. The whole system of wires is turned about in its own plane, by turning the eye-tube round with a hand, and by that means the wire *mn* can be thrown into any position, and consequently angles in any position may be measured. Dr Bradley added a small motion by a rack and pinion to set the wires more accurately in any position.

Instead of two plates, two wires were afterwards put; and Sir Isaac Newton observed that the diameters of the planets measured by the plates were somewhat bigger than they ought, as appeared by comparing Mr Huygens's measures with others taken with the wires; and also by comparing the diameter of mercury observed in and out of the sun's disk, the latter being the greatest. Dark objects on bright ones appear less, and light objects on dark ones appear greater, than if they were equally bright; owing, perhaps, to the brighter image on the retina diffusing itself into the darker: and the bright image of the planet being intercepted by the plates, the faint diffused light becomes more sensible, and is mistaken for the edge of the planet.

But the micrometer, as now contrived, is of use, not only to find the angular distance of bodies in the field of view at the same time, but also of those which, when the telescope is fixed, pass through the field of view successively; by which means we can find the difference of their right ascensions and declinations. Let A *a*, B *b*, C *c*, be three parallel and equidistant wires, the middle one bisecting the field of view; H O R a fixed wire perpendicular to them passing through the centre of the field; and F *f*, G *g*, two wires parallel to it, each moveable by a micrometer screw, as before, so that they can be brought up to H O R, or a little beyond. Then to find the angular distance of two objects, bring them very near to B*b*, and in a line parallel to it, by turning about the wires, and bring one upon HOR, and by the micrometer screw make F *f* or *Gg* pass through the other; then turn the screw till that wire coincides with H O R, and the arc which the index has passed over shows their angular distance. If the objects be further remote than you can carry the distance of one of the wires F *f*, G *g*, from H O R, then bring one object to F *f* and the other to G *g*; and turn each micrometer screw till they meet, and the sum of the arcs passed over by each index gives their angular distance. If the objects be two stars, and one of them be made to run along H O R, or either of the moveable wires as occasion may require, the motion of the other will be parallel to these wires, and their difference of declinations may be observed with great exactness; but in taking any other distances, the motion of the stars being oblique to them, it is not quite so easy to get them parallel to B *b*; because if one star be brought near, and the eye be applied to the other to adjust the wires to it, the former star will have gotten a little away from the wire. Dr Bradley, in his account of the use of this micrometer, published by Dr Maskeleyne in the Philosophical Transactions for 1772, thinks the best way is to move the eye backwards and forwards as quick as possible; but it seems to me to be best to fix the eye at some point between, by which means it takes in both at once sufficiently well defined to compare them with B *b*. In finding the difference of declinations, if both bodies do not come into the field of view at the same time, make one run along the wire H O R, as before, and fix the telescope and wait till the other comes in, and then adjust one of the moveable wires to it, and bring it up to H O R, and the index gives the difference of their declinations. The difference of time between the passage of the star at either of the cross moveable wires, and the transit of the other star over the cross fixed wire (which represents a meridian), turned into degrees and minutes, will give the difference of right ascension. The star has been here supposed to be bisected by the wire; but if the wire be a tangent to it, allowance must be made for the breadth of the wire, provided the adjustment be made for the coincidence of the wires. In observing the diameters of the sun, moon, or planets, it may perhaps be most convenient to make use of the outer edges of the wires, because they appear most distinct when quite within the limb: but if there should be any sensible inflection of the rays of light in passing by the wires, it will be best avoided by using the inner edge of one wire and the outward edge of the other; for by that means the inflection at both limbs will be the same way, and therefore there will be no alteration of the relative position of the rays passing by each wire. And it will be convenient in the micrometer to note at what division the index stands when the moveable wire coincides with H O R; for then you need not bring the wire when a star is upon it up to H O R, only reckon from the division at which the index then stands to the above division.

With a micrometer therefore thus adapted to a telescope, Mr Servington Savery of Exeter proposed a new way of measuring the difference between the greatest and least apparent diameters of the sun, although the whole of the sun was not visible in the field of view at once. The method we shall briefly describe. Place two object-glasses instead of one, so as to form two images whose limbs shall be at a small distance from each other; or instead of two perfect lenses, he proposed to cut a single lens into four parts of equal breadths by parallel lines, and to place the two segments with their straight sides against each other, or the two middle frustrums with their opposite edges together; in either case, the two parts which before had a common centre and axis, have now their centres and axes separated, and consequently two images will be formed as before by two perfect lenses. Another method in reflectors was to cut the large concave reflector through the centre, and by a contrivance to turn up the outer edges whilst the straight ones remained

mained fixed; by which means the axis of the two parts became inclined, and formed two images. Two images being formed in this manner, he proposed to measure the distance between the limbs when the diameters of the sun were the greatest and least, the difference of which would be the difference of the diameters required. Thus far we are indebted to Mr Savery for the idea of forming two images; and the admirable uses to which it was afterwards applied, we shall next proceed to describe.

The divided object-glass micrometer, as now made, was contrived by the late Mr John Dollond, and by him adapted to the object-end of a reflecting telescope, and has been since by the present Mr P. Dollond his son applied with equal advantage to the end of an achromatic telescope. The principle is this: The object glass is divided into two segments in a line drawn through the centre; each segment is fixed in a separate frame of brass, which is moveable, so that the centres of the two segments may be brought together by a handle for that purpose, and thereby form one image of an object; but when separated they will form two images, lying in a line passing through the centre of each segment; and consequently the motion of each image will be parallel to that line, which can be thrown into any position by the contrivance of another handle to turn the glass about in its own plane. The brass-work carries a vernier to measure the distance of the centres of the two segments. Now let E and H be the centres of the two segments, F their principal focus, and P Q two distant objects in FE, FH, produced, or the opposite limbs of the same object PBQD; then the images of P and Q, formed by each segment, or the images of the opposite limbs of the object PBQD, coincide at F: hence two images mzF, nxF of that object are formed, whose limbs are in contact; therefore the angular distance of the points P and Q is the same as the angle which the distance EH subtends at F, which, as the angles supposed to be measured are very small, will vary as EH extremely nearly; and consequently if the angle corresponding to one interval of the centres of the segments be known, the angle corresponding to any other will be found by proportion. Now to find the interval for some one angle, take the horizontal diameter of the sun on any day, by separating the images till the contrary limbs coincide, and read off by the vernier the interval of their centres, and look into the nautical almanac for the diameter of the sun on that day, and you have the corresponding angle. Or if greater exactness be required than from taking the angle in proportion to the distances of their centres, we may proceed thus:—Draw FG perpendicular to EH, which therefore bisects it; then one half EH, or EG, is the tangent of half the angle EFH; hence, half the distance of their centres : tangent of half the angle corresponding to that distance : : half any other distance of the centres : tangent of half the corresponding angle (A).

Fig 3.

Hence the method of measuring small angles is manifest; for we consider P, Q, either as two objects whose images are brought together by separating the two segments, or as the opposite limbs of one object PBQA, whose images, formed by the two segments E, H, touch at F: in the former case, EFH gives the angular distance of the two objects; and in the latter, it gives the angle under which the diameter of the object appears. Hence, to find the angular distance of two objects, separate the segments till the two images which approach (B) each other coincide; and to find the diameter of an object, separate the segments till the contrary limbs of the images touch each other, and read off the distance of the centres of the segment from the vernier (C), and find the angle as directed in the last article. From hence appears one great superiority in this above the wire micrometer; as, with this, any diameter of an object may be measured with the same ease and accuracy; whereas with that we cannot with accuracy measure any diameter, except that which is at right angles to its apparent motion.

But, besides these two uses to which the instrument seems so well adapted, Dr Maskelyne has shown, in the Philosophical Transactions for the year 1771, how it may be applied to find the difference of right ascensions and declinations. For this purpose, two wires at right angles to each other, bisecting the field of view, must be placed in the principal focus of the eye-glass, and moveable about in their own plane.— Let

(A) If the object be not a distant one, let f be the principal focus; then Ff : FG : : FG : FK (FG being produced to meet a line joining the apparent places of the two objects P, Q), ∴ dividendo, fG : FG : : GK : FK, and alternando, fG : GK : : FG : FK : : (by similar triangles) EH : PQ, hence $\frac{EH}{fG}=\frac{PQ}{GK}$, therefore the angle subtended by EH at f = the angle subtended by PQ at G; and consequently, as fG is constant, the angle measured at G is, in this case also, in proportion to EH. The instrument is not adapted to measure the angular distance of bodies, one of which is near and the other at a distance, because their images would not be formed together.

(B) Besides these two images, there will be two others receding from each other, for each segment gives an image of each object.

(C) To determine whether there be any error of adjustment of the micrometer scale, measure the diameter of any small well defined object, as Jupiter's equatorial diameter, or the longest axis of Saturn's ring, both ways, that is, with 0 on the vernier to the right and left of 0 on the scale, and half the difference is the error required; which must be added to or subtracted from all observations, according as the diameter measured with 0 on the vernier, when advanced on the scale, is less or greater than the diameter measured the other way. And it is also evident, that half the sum of the diameters thus measured gives the true diameter of the object.

Let HCRc be the field of view, HR and Cc the two wires; turn the wires till the westernmost star (which is the best, having further to move) run along ROH; then separate the two segments and turn about the micrometer till the two images of the same star lie in the wire Cc; and then, partly by separating the segments, and partly by raising or depressing the telescope, bring the two innermost images of the two stars to appear and run along ROH, as a, b, and the vernier will give the difference of their declinations; because, as the two images of one of the stars coincided with Cc, the image of each star was brought perpendicularly upon HR, or to HR in their proper meridian. And, for the same reason, the difference of their times of passing the wire CO. will give their difference of right ascensions. These operations will be facilitated, if the telescope be mounted on a polar axis. If two other wires KL, MN, parallel to Cc, be placed near H and R, the observation may be made on two stars whose difference of meridians is nearly equal to HR the diameter of the field of view, by bringing the two images of one of the stars to coincide with one of these wires. If two stars be observed whose difference of declinations is well settled, the scale of the micrometer will be known.

It has hitherto been supposed, that the images of the two stars can be both brought into the field of view at once upon the wire HOR; but if they cannot, set the micrometer to the difference of their declinations as nearly as you can, and make the image which comes first run along the wire HOR, by elevating or depressing the telescope; and when the other star comes in, if it do not also run along HOR, alter the micrometer till it does, and half the sum of the numbers shown by the micrometer at the two separate observations of the two stars on the wire HOR will be the difference of their declinations. That this should be true, it is manifestly necessary that the two segments should recede equally in opposite directions; and this is effected by Mr Dollond in his new improvement of the object-glass micrometer.

The difference of right ascensions and declinations of Venus or Mercury in the sun's disk and the sun's limb may be thus found. Turn the wires so that the north limb n of the sun's image AB, or the north limb of the image V of the planet, may run along the wire RH, which therefore will then be parallel to the equator, and consequently Cc a secondary to it; then separate the segments, and turn about the micrometer till the two images Vv of the planet pass Cc at the same time, and then by separating the segments, bring the north limb of the northernmost image V of the planet to touch HR, at the time the northernmost limb n of the southernmost image AB of the sun touches it, and the micrometer shows the difference of declinations of the northernmost limbs of the planet and sun, for the reason formerly given †, we having brought the northernmost limbs of the two innermost images V and AB to HR, these two being manifestly interior to v and the northernmost limb N of the image PQ. In the same manner we take the difference of declinations of their southernmost limbs; and half the difference of the two measures, (taking immediately one after another) is equal to the difference of the declinations of their centres, without any regard to the sun's or planet's diameters, or error of adjustment of the micrometer; for as it affects both equally, the difference is the same as if there were no error: and the difference of the times of the transits of the eastern or western limbs of the sun and planet over Cc gives the difference of their right ascensions.

Instead of the difference of right ascensions, the distance of the planet from the sun's limb, in lines parallel to the equator, may be more accurately observed thus: Separate the segments, and turn about the wires and micrometer, so as to make both images V, v, run along HR, or so that the two intersections I, T, of the sun's image may pass Cc at the same time. Then bring the planet's and sun's limbs into contact, as at V, and do the same for the other limb of the sun, and half the difference gives the distance of the centre of the planet from the middle of the chord on the sun's disk parallel to the equator, or the difference of the right ascensions of their centres, allowing for the motion of the planet in the interval of the observations, without any regard to the error of adjustment, for the same reason as before. For if you take any point in the chord of a circle, half the difference of the two segments is manifestly the distance of the point from the middle of the chord; and as the planet runs along HR, the chord is parallel to the equator. Fig. 6.

In like manner, the distances of their limbs may be measured in lines perpendicular to the equator, by bringing the micrometer into the position already described*, and instead of bringing V to HR, separate the segments till the northernmost limbs coincide as at V; and in the same manner make their southernmost images to coincide, and half the difference of the two measures, allowing for the planet's motion, gives the difference of the declinations of their centres. Fig. 7.

* See the preceding column, par. 3.

Hence the true place of a planet in the sun's disk may at any time of its transit be found; and consequently the nearest approach to the centre and the time of ecliptic conjunction may be deduced, although the middle should not be observed.

But however valuable the object-glass micrometer undoubtedly is, difficulties sometimes have been found in its use, owing to the alteration of the focus of the eye, which will cause it to give different measures of the same angle at different times. For instance, in measuring the sun's diameter, the axis of the pencil coming through the two segments from the contrary limbs of the sun, as PF, QF, fig. 3. crossing one another in the focus F under an angle equal to the sun's semidiameter, the union of the limbs cannot appear perfect, unless the eye be disposed to see objects distinctly at the place where the images are formed; for if the eye be disposed to see objects nearer to or further off than that place, in the latter case the limbs will appear separated, and in the former they will appear to lap over (D). This imperfection led Dr Maskelyne

(D) For if the eye can see distinctly an image at F, the pencils of rays, of which PF, QF are the two axes, diverging from F, are each brought to a focus on the retina at the same point; and therefore the two limbs appear

Micrometer.

ſkelyne to inquire, whether ſome method might not be found of producing two diſtinct images of the ſun, or any other object, by bringing the axis of each pencil to coincide, or very nearly ſo, before the formation of the images, by which means the limbs when brought together would not be liable to appear ſeparated from any alteration of the eye; and this he found would be effected by the refraction of two priſms, placed either without or within the teleſcope; and on this principle, placing the priſms within, he conſtructed a new micrometer, and had one executed by Mr Dollond, which upon trial anſwered as he expected. The conſtruction is as follows.

Fig. 8, 9. Let AB be the object-glaſs; *ab* the image, ſuppoſe of the ſun, which would have been formed in the principal focus Q; but let the priſms PR, SR be placed to intercept the rays, and let EF, WG, be two rays proceeding from the eaſtern and weſtern limbs of the ſun, converging, after refraction at the lens, to *a* and *b*; and ſuppoſe the refraction of the priſms to be ſuch, that in fig. 8. the ray EFR, after refraction at R by the priſm PR, may proceed in the direction RQ; and as all the rays which were proceeding to *a* ſuffer the ſame refraction at the priſm, they will all be refracted to Q; and therefore, inſtead of an image *ab*, which would have been formed by the lens alone, an image Q*c* is formed by thoſe rays which fall on the priſm PR; and for the ſame reaſon, the rays falling on the priſm SR will form an image Q*d*: and in fig. 9. the image of the point *b* is brought to Q, by the priſm PR, and conſequently an image Q*d* is formed by thoſe rays which fall on PR: and for the ſame reaſon, an image Q*c* is formed by the rays falling on SR. Now in both caſes, as the rays EFR, WGR, coming from the two oppoſite limbs of the ſun, and forming the point of contact of the two limbs, proceed in the ſame direction RQ, they muſt thus accompany each other through the eye-glaſs and alſo through the eye, whatever refractive power it has, and therefore to every eye the images muſt appear to touch. Now the angle *a*R*b* is twice the refraction of the priſm, and the angle *a*C*b* is the diameter of the ſun; and as theſe angles are very ſmall, and have the ſame ſubtenſe *ab*, we have the angle *a*R*b* : angle *a*C*b* : : CQ : RQ.— Now as CQ is conſtant, and alſo the angle *a*R*b*, being twice the refraction of the priſm, the angle *a*C*b* varies as RQ. Hence the extent of the ſcale for meaſuring angles becomes the focal length of the object glaſs, and the angle meaſured is in proportion to the diſtance of the priſms from the principal focus of the object glaſs; and the micrometer can meaſure all angles (very ſmall ones excepted, for the reaſon afterwards given*) which do not exceed the ſum of the refractions of the priſms; for the angle *a*C*b*, the diameter of the object to be meaſured, is always *leſs* than the angle *a*R*b*, the ſum of the refractions of the priſms, except when the priſms touch the object glaſs, and then they become *equal*. The ſcale can never be out of adjuſtment, as the point o, where the meaſurement begins, anſwers to the focus of the object glaſs, which is a fixed point for all diſtant objects, and we have only to find the value of the ſcale anſwering to ſome known angle: for inſtance, bring the two limbs of the ſun's images into contact, and meaſure the diſtance of the priſms from the focus, and look in the nautical almanac for the ſun's diameter, and you get the value of the ſcale.

* Next col. Par. laſt.

In fig. 8. the limb Q, of the image Q*c*, is illuminated by the rays falling on the object glaſs between A and F, and of the image Q*d* by thoſe falling between B and G; but in fig. 9. the ſame limbs are illuminated by the rays falling between B and F, A and G reſpectively, and therefore will be more illuminated than in the other caſe; but the difference is not conſiderable in achromatic teleſcopes, on account of the great aperture of the object-glaſs compared with the diſtance FG.

It might be convenient to have two ſets of priſms, one for meaſuring angles not exceeding 36′, and therefore fit for meaſuring the diameters of the ſun and moon, and the lucid parts and diſtances of the cuſps in their eclipſes; and another for meaſuring angles not much greater than 1′, for the conveniency of meaſuring the diameters of the planets. For as QC : QR : : ſum of the refractions of the priſms : angle *a*C*b*, the apparent diameter of the object, it is evident that if you diminiſh the third term, you muſt increaſe the ſecond in the ſame ratio, in order to meaſure the ſame angle; and thus by diminiſhing the refractive angle of the priſms, you throw them further from Q, and conſequently avoid the inconvenience of bringing them near to Q, for the reaſon in the next paragraph; and at the ſame time you will increaſe the illumination in a ſmall degree. The priſms muſt be achromatic, each compoſed of two priſms of flint and crown glaſs, placed with their refracting angles contrariways, otherwiſe the images will be coloured.

In the conſtruction here deſcribed, the angle meaſured becomes evaneſcent when the priſms come to the principal focus of the object glaſs, and therefore o on the ſcale then begins: but if the priſms be placed in the principal focus they can have no effect, becauſe the pencil of rays at the junction of the priſms would then vaniſh, and therefore it is not practicable to bring the two images together to get o on the ſcale. Dr Maſkelyne, therefore, thought of placing another pair of priſms within, to refract the rays *before* they came to the other priſms, by which means the two images would be formed into one before they came to the principal focus, and therefore o on the ſcale could be determined. But to avoid the error ariſing from the multiplication of mediums, he, inſtead of adding another pair of priſms, divided the object glaſs through its centre, and ſliding the ſegments a little it ſeparated the images, and then by the priſms he could form one image very diſtinctly, and conſequently could determine o on the ſcale; for by ſeparating the two ſegments you form two images, and you will ſeparate the two pencils ſo that you may move up the two priſms, and the two pencils will fall on each reſpectively, and the two images may be formed into one. In the inſtrument which Dr Maſkelyne had made, o on the ſcale was choſen to be about $\frac{2}{7}$ of the focal length of the object-glaſs,

appear to coincide: but if we increaſe the refractive power of the eye, then each pencil is brought to a focus, and they croſs each other before the rays come to the retina, conſequently the two limbs on the retina will lap over; and if we diminiſh the refractive power of the eye, then each pencil being brought to a focus beyond the retina, and not croſſing till after they have paſſed it, the two limbs on the retina muſt be ſeparated.

glafs, and each prifm refracted 27′. By this means all angles are meafured down to 0.

In the Philofophical Tranfactions for 1779, Mr Ramfden has defcribed two new micrometers, which he contrived with a view of remedying the defects of the object-glafs micrometer.

1. One of thefe is a *catoptric* micrometer, which, befide the advantage it derives from the principle of reflection, of not being difturbed by the heterogeneity of light, avoids every defect of other micrometers, and can have no aberration, nor any defect arifing from the imperfection of materials or of execution; as the extreme fimplicity of its conftruction requires no additional mirrors or glaffes to thofe required for the telefcope; and the feparation of the image being effected by the inclination of the two fpecula, and not depending on the focus of any lens or mirror, any alteration in the eye of an obferver cannot affect the angle meafured. It has peculiar to itfelf the advantages of an adjuftment, to make the images coincide in a direction perpendicular to that of their motion; and alfo of meafuring the diameter of a planet on both fides of the zero, which will appear no inconfiderable advantage to obfervers who know how much eafier it is to afcertain the contact of the external edges of two images than their perfect coincidence.

A reprefents the fmall fpeculum divided into two equal parts; one of which is fixed on the end of the arm B; the other end of the arm is fixed on a fteel axis X, which croffes the end of the telefcope C. The other half of the mirror A is fixed on the arm D, which arm at the other end terminates in a focket *y*, that turns on the axis X; both arms are prevented from bending by the braces *a a*. G reprefents a double fcrew, having one part *e* cut into double the number of threads in an inch to that of the part *g*: the part *e* having 100 threads in one inch, and the part *g* 50 only. The fcrew *e* works in a nut F in the fide of the telefcope, while the part *g* turns in a nut H, which is attached to the arm B; the ends of the arms B and D, to which the mirrors are fixed, are feparated from each other by the point of the double fcrew preffing againft the ftud *b*, fixed to the arm D, and turning in the nut H on the arm B. The two arms B and D are preffed againft the direction of the double fcrew *eg* by a fpiral fpring within the part *n*, by which means all fhake or play in the nut H, on which the meafure depends, is entirely prevented.

From the difference of the threads on the fcrew at *e* and *g*, it is evident, that the progreffive motion of the fcrew through the nut will be half the diftance of the feparation of the two halves of the mirror; and confequently the half mirrors will be moved equally in contrary directions from the axis of the telefcope C.

The wheel V fixed on the end of the double fcrew has its circumference divided into 100 equal parts, and numbered at every fifth divifion with 5, 10, &c. to 100, and the index I fhows the motion of the fcrew with the wheel round its axis, while the number of revolutions of the fcrew is fhown by the divifions on the fame index. The fteel fcrew at R may be turned by the key S, and ferves to incline the fmall mirror at right angles to the direction of its motion. By turning the finger-head T (fig. 11.), the eye-tube P is brought nearer or farther from the fmall mirror, to adjuft the telefcope to diftinct vifion; and the telefcope itfelf hath a motion round it axis for the conveniency of meafuring the diameter of a planet in any direction. The inclination of the diameter meafured with the horizon is fhown in degrees and minutes by a level and vernier on a graduated circle, at the breech of the telefcope. Micrometer.

"It is neceffary to obferve (fays Mr Ramfden), that, befides the table for reducing the revolutions and parts of the fcrew to minutes, feconds, &c. it may require a table for correcting a very fmall error which arifes from the excentric motion of the half-mirrors. By this motion their centres of curvature will (when the angle to be meafured is large) approach a little towards the large mirror: the equation for this purpofe in fmall angles is infenfible; but when angles to be meafured exceed ten minutes, it fhould not be neglected. Or, the angle meafured may be corrected by diminifhing it in the proportion the verfed fine of the angle meafured, fuppofing the eccentricity radius, bears to the focal length of the fmall mirror."

Mr Ramfden preferred Caffegrain's conftruction of the reflecting telefcope to either the Gregorian or Newtonian; becaufe in the former, errors caufed by one fpeculum are diminifhed by thofe in the other. From a property of the reflecting telefcope (which, he obferves, has not been attended to), that the apertures of the two fpecula are to each other very nearly in the proportion of their focal lengths, it follows, that their aberrations will be to each other in the fame proportion; and thefe aberrations are in the fame direction, if the two fpecula are both concave; or in contrary directions, if one fpeculum is concave and the other convex. In the Gregorian conftruction, both fpecula being concave, the aberration at the fecond image will be the fum of the aberrations of the two mirrors; but in the Caffegrain conftruction, one mirror being concave and the other convex, the aberration at the fecond image will be the difference between their aberrations. By affuming fuch proportions for the *foci* of the fpecula as are generally ufed in the reflecting telefcope, which is about as 1 to 4, the aberration in the Caffegrain conftruction will be to that in the Gregorian as 3 to 5.

2. The other is a *dioptric* micrometer, or one fuited to the principle of refraction. This micrometer is applied to the erect eye-tube of a refracting telefcope, and is placed in the conjugate focus of the firft eye-glafs: in which pofition, the image being confiderably magnified before it comes to the micrometer, any imperfection in its glafs will be magnified only by the remaining eye-glaffes, which in any telefcope feldom exceeds five or fix times. By this pofition alfo the fize of the micrometer glafs will not be the [illegible] part of the area which would be required if it was placed in the object-glafs; and, notwithftanding this great difproportion of fize, which is of great moment to the practical optician, the fame extent of fcale is preferved, and the images are uniformly bright in every part of the field of the telefcope.

Fig. 12. reprefents the glaffes of a refracting telefcope; *xy*, the principal pencil of rays from the object-glafs O; *t t* and *u u*, the axis of two oblique pencils; *a*, the firft eye-glafs; *m*, its conjugate focus, or the place Plate CCXCVI.

Micrometer.

place of the micrometer; *b* the second eye-glass; *c* the third; and *d* the fourth, or that which is nearest the eye. Let *p* be the diameter of the object-glass, *e* the diameter of a pencil at *m*, and *f* the diameter of the pencil at the eye; it is evident, that the axis of the pencils from every part of the image will cross each other at the point *m*; and *e*, the width of the micrometer-glass, is to *p* the diameter of the object-glass as *m o* is to *g o*, which is the proportion of the magnifying power at the point *m*; and the error caused by an imperfection in the micrometer glass placed at *m* will be to the error, had the micrometer been at O, as *m* is to *p*.

Fig. 13. represents the micrometer; A, a convex or concave lens divided into two equal parts by a plane across its centre; one of these semi-lenses is fixed in a frame B, and the other in the frame E; which two frames slide on a plate H, and are pressed against it by thin plates *a a*: the frames B and E are moved in contrary directions by turning the button D; L is a scale of equal parts on the frame B; it is numbered from each end towards the middle with 10, 20, &c. There are two verniers on the frame E, one at M and the other at N, for the convenience of measuring the diameter of a planet, &c. on both sides the zero. The first division on both these verniers coincides at the same time with the two zeros on the scale L; and, if the frame is moved towards the right, the relative motion of the two frames is shown on the scale L by the vernier M; but if the frame B be moved towards the left, the relative motion is shown by the vernier N.—This micrometer has a motion round the axis of vision, for the convenience of measuring the diameter of a planet, &c. in any direction, by turning an endless screw F; and the inclination of the diameter measured with the horizon is shown on the circle *g* by a vernier on the plate V. The telescope may be adjusted to distinct vision by means of an adjusting screw, which moves the whole eye-tube with the micrometer nearer or farther from the object-glass, as telescopes are generally made: or the same effect may be produced in a better manner, without moving the micrometer, by sliding the part of the eye tube *m* on the part *n*, by help of a screw or pinion. The micrometer is made to take off occasionally from the eye tube, that the telescope may be used without it.

Still, however, micrometers remained in several respects imperfect. In particular, the imperfections of the parallel-wire micrometer in taking the distance of very close double stars, are the following.

When two stars are taken between the parallels, the diameters must be included. Mr Herschel informs us, he has in vain attempted to find lines sufficiently thin to extend them across the centres of the stars so that their thickness might be neglected. The single threads of the silk-worm, with such lenses as he uses, are so much magnified that their diameter is more than that of many of the stars. Besides, if they were much less than they are, the power of deflection of light would make the attempt to measure the distance of the centres this way fruitless: for he has always found the light of the stars to play upon those lines and separate their apparent diameters into two parts. Now since the spurious diameters of the stars thus included, as Mr. Herschel assures us, are continually changing according to the state of the air, and the length of time we look at them, we are, in some respect, left at an uncertainty, and our measures taken at different times and with different degrees of attention, will vary on that account. Nor can we come at the true distance of the centres of any two stars, one from another, unless we could tell what to allow for the semidiameters of the stars themselves; for different stars have different apparent diameters, which, with a power of 227, may differ from each other as far as two seconds.

The next imperfection is that which arises from a deflection of light upon the wires when they approach very near to each other; for if this be owing to a power of repulsion lodged at the surface, it is easy to understand, that such powers must interfere with each other, and give the measures larger in proportion than they would have been if the repulsive power of one wire had not been opposed by a contrary power of the other wire.

Another very considerable imperfection of these micrometers is a continual uncertainty of the real zero. Mr Herschel has found, that the least alteration in the situation and quantity of light will affect the zero, and that a change in the position of the wires, when the light and other circumstances remain unaltered, will also produce a difference. To obviate this difficulty, whenever he took a measure that required the utmost accuracy, his zero was always taken immediately after, while the apparatus remained in the same situation it was in when the measure was taken; but this enhances the difficulty, because it introduces an additional observation.

The next imperfection, which is none of the smallest, is that every micrometer that has hitherto been in use requires either a screw or a divided bar and pinion, to measure the distance of the wires or divided image. Those who are acquainted with works of this kind are but too sensible how difficult it is to have screws that shall be perfectly equal in every thread or revolution of each thread; or pinions and bars that shall be so evenly divided as perfectly to be depended upon in every leaf and tooth to perhaps the two, three, or four thousandth part of an inch: and yet, on account of the small scale of those micrometers, these quantities are of the greatest consequence; an error of a single thousandth part inducing in most instruments a mistake of several seconds.

The last and greatest imperfection of all is, that these wire micrometers require a pretty strong light in the field of view; and when Mr Herschel had double stars to measure, one of which was very obscure, he was obliged to be content with less light than is necessary to make the wires perfectly distinct; and several stars on this account could not be measured at all, though otherwise not too close for the micrometer.

Mr Herschel, therefore, having long had much occasion for micrometers that would measure exceeding small distances exactly, was led to bend his attention to the improvement of these instruments; and the result of his endeavours has been a very ingenious instrument called a *lamp-micrometer*, which is not only free from the imperfections above specified, but also possesses the advantages of a very large scale. This instrument is described in the Philosophical Transactions for 1782; and the construction of it is as follows:

ABGCFE

ABGCFE (fig. 14.) is a ftand nine feet high, upon which a femicircular board *qhogp* is moveable upwards or downwards, in the manner of fome fire-fcreens, as occafion may require, and is held in its fituation by a peg *p* put into any one of the holes of the upright piece AB. This board is a fegment of a circle of fourteen inches radius, and is about three inches broader than a femicircle, to give room for the handles *r*D, *e*P, to work. The ufe of this board is to carry an arm L, thirty inches long, which is made to move upon a pivot at the centre of the circle, by means of a ftring, which paffes in a groove upon the edge of the femicircle *pgohq*; the ftring is faftened to a hook at *o* (not expreffed in the figure, being at the back of the arm L), and paffing along the groove from *oh* to *q* is turned over a pulley at *q*, and goes down to a fmall barrel *e*, within the plane of the circular board, where a double-jointed handle *e*P commands its motion. By this contrivance, we fee, the arm L may be lifted up to any altitude from the horizontal pofition to the perpendicular, or be fuffered to defcend by its own weight below the horizontal to the reverfe perpendicular fituation. The weight of the handle P is fufficient to keep the arm in any given pofition; but if the motion fhould be too eafy, a friction fpring applied to the barrel will moderate it at pleafure.

In front of the arm L a fmall flider, about three inches long, is moveable in a rabbet from the end L towards the centre backwards and forwards. A ftring is faftened to the left fide of the little flider, and goes towards L, where it paffes round a pulley at *m*, and returns under the arm from *m*, *n*, towards the centre, where it is led in a groove on the edge of the arm, which is of a circular form, upwards to a barrel (raifed above the plane of the circular board) at *r*, to which the handle *r*D is faftened. A fecond ftring is faftened to the flider, at the right fide, and goes towards the centre, where it paffes over a pulley *n*; and the weight *w*, which is fufpended by the end of this ftring, returns the flider towards the centre, when a contrary turn of the handle permits it to act.

By *a* and *b* are reprefented two fmall lamps, two inches high, $1\frac{1}{2}$ in breadth by $1\frac{1}{4}$ in depth. The fides, back, and top, are made fo as to permit no light to be feen, and the front confifts of a thin brafs fliding door. The flame in the lamp *a* is placed three-tenths of an inch from the left fide, three-tenths from the front, and half an inch from the bottom. In the lamp *b* it is placed at the fame height and diftance, meafuring from the right fide. The wick of the flame confifts only of a fingle very thin lamp cotton-thread; for the fmalleft flame being fufficient, it is eafier to keep it burning in fo confined a place. In the top of each lamp muft be a little flit lengthways, and alfo a fmall opening in one fide near the upper part, to permit air enough to circulate to feed the flame. To prevent every reflection of light, the fide opening of the lamp *a* fhould be to the right, and that of the lamp *b* to the left. In the fliding door of each lamp is made a fmall hole with the point of a very fine needle juft oppofite the place where the wicks are burning, fo that when the fliders are fhut down, and every thing dark, nothing fhall be feen but two fine lucid points of the fize of two ftars of the third or fourth magnitude. The lamp *a* is placed fo that its lucid point may be in the centre of the circular board where it remains fixed. The lamp *b* is hung to the little flider which moves in the rabbet of the arm, fo that its lucid point, in an horizontal pofition of the arm, may be on a level with the lucid point in the centre. The moveable lamp is fufpended upon a piece of brafs faftened to the flider by a pin exactly behind the flame, upon which it moves as a pivot. The lamp is balanced at the bottom by a leaden weight, fo as always to remain upright, when the arm is either lifted above or depreffed below the horizontal pofition. The double-jointed handles *r*D, *e*P, confift of light deal rods, ten feet long, and the loweft of them may have divifions, marked upon it near the end P, expreffing exactly the diftance from the central lucid point in feet, inches, and tenths.

From this conftruction we fee, that a perfon at a diftance of ten feet may govern the two lucid points, fo as to bring them into any required pofition fouth or north preceding or following from 0 to 90° by ufing the handle P, and alfo to any diftance from fix-tenths of an inch to five or fix and twenty inches by means of the handle D. If any reflection or appearance of light fhould be left from the top or fides of the lamps, a temporary fcreen, confifting of a long piece of pafteboard, or a wire frame covered with black cloth, of the length of the whole arm, and of any required breadth, with a flit of half an inch broad in the middle, may be affixed to the arm by four bent wires projecting an inch or two before the lamps, fituated fo that the moveable lucid point may pafs along the opening left for that purpofe.

Fig. 15. reprefents part of the arm L, half the real fize; S the flider; *m* the pulley, over which the cord *xtyz* is returned towards the centre; *v* the other cord going to the pulley *n* of fig. 14. R the brafs piece moveable upon the pin *c*, to keep the lamp upright. At R is a wire rivetted to the brafs piece, upon which is held the lamp by a nut and fcrew. Fig. 16. 17. reprefent the lamps *a*, *b*, with the fliding doors open, to fhow the fituation of the wicks. W is the leaden weight with a hole *d* in it, through which the wire R of fig. 15. is to be paffed when the lamp is to be faftened to the flider S. Fig. 18. reprefents the lamp *a* with the fliding door fhut; *l* the lucid point; and *ik* the openings at the top, and *s* at the fides, for the admiffion of air.

"Every ingenious artift (fays Mr Herfchel) will foon perceive, that the motions of this micrometer are capable of great improvement by the application of wheels and pinions, and other well known mechanical refources; but as the principal object is only to be able to adjuft the two lucid points to the required pofition and diftance, and to keep them there for a few minutes, while the obferver goes to meafure their diftance, it will not be neceffary to fay more upon the fubject.

"I am now to fhow the application of this inftrument. It is well known to opticians and others who have been in the habit of ufing optical inftruments, that we can with one eye look into a microfcope or telefcope, and fee an object much magnified, while the naked eye may fee a fcale upon which the magnified picture is thrown. In this manner I have generally determined the power of my telefcopes; and any one who has acquired a facility of taking fuch obfervations will

will very feldom miftake fo much as one in fifty in determining the power of an inftrument, and that degree of exactnefs is fully fufficient for the purpofe.

"The Newtonian form is admirably adapted to the ufe of this micrometer; for the obferver ftands always erect, and looks in a horizontal direction, notwithftanding the telefcope fhould be elevated to the zenith. Befides, his face being turned away from the object to which his telefcope is directed, this micrometer may be placed very conveniently without caufing the leaft obftruction to the view: therefore, when I ufe this inftrument, I put it at ten feet diftance from the left eye, in a line perpendicular to the tube of the telefcope, and raife the moveable board to fuch a height that the lucid point of the central lamp may be upon a level with the eye. The handles, lifted up, are paffed through two loops faftened to the tube, juft by the obferver, fo as to be ready for his ufe. I fhould obferve, that the end of the tube is cut away, fo as to leave the left eye entirely free to fee the whole micrometer.

"Having now directed the telefcope to a double ftar, I view it with the right eye, and at the fame time with the left fee it projected upon the micrometer: then, by the handle P, which commands the pofition of the arm, I raife or deprefs it fo as to bring the two lucid points to a fimilar fituation with the two ftars; and, by the handle D, I approach or remove the moveable lucid point to the fame diftance of the two ftars, fo that the two lucid points may be exactly covered by or coincide with the ftars. A little practice in this bufinefs foon makes it eafy, efpecially to one who has already been ufed to look with both eyes open.

"What remains to be done is very fimple. With a proper rule, divided into inches and fortieth parts, I take the diftance of the lucid points, which may be done to the greateft nicety, becaufe, as I obferved before, the little holes are made with the point of a very fine needle. The meafure thus obtained is the tangent of the magnified angle under which the ftars are feen to a radius of ten feet; therefore, the angle being found and divided by the power of the telefcope gives the real angular diftance of the centres of a double ftar.

"For inftance, September 25, 1781, I meafured ϵ Herculis with this inftrument. Having caufed the two lucid points to coincide exactly with the ftars centre upon centre, I found the radius or diftance of the central lamp from the eye 10 feet 4.15 inches; the tangent or diftance of the two lucid points 50.6 fortieth parts of an inch; this gives the magnified angle 35', and dividing by the power 460, which I ufed, we obtain 4'' 34''' for the diftance of the centres of the two ftars. The fcale of the micrometer at this very convenient diftance, with the power of 460 (which my telefcope bears fo well upon the fixed ftars that for near a twelvemonth paft I have hardly ufed any other), is above a quarter of an inch to a fecond; and by putting on my power of 932, which in very fine evenings is extremely diftinct, I obtain a fcale of more than half an inch to a fecond, without increafing the diftance of the micrometer; whereas the moft perfect of my former micrometers, with the fame inftrument, had a fcale of lefs than the two thoufandth part of an inch to a fecond.

"The meafures of this micrometer are not confined to double ftars only, but may be applied to any other objects that require the utmoft accuracy, fuch as the diameters of the planets or their fatellites, the mountains of the moon, the diameters of the fixed ftars, &c.

"For inftance, October 22. 1781, I meafured the apparent diameter of α Lyræ; and judging it of the greateft importance to increafe my fcale as much as convenient, I placed the micrometer at the greateft convenient diftance, and (with fome trouble, for want of longer handles, which might eafily be added) took the diameter of this ftar by removing the two lucid points to fuch a diftance as juft to enclofe the apparent diameter. When I meafured my radius, it was found to be twenty-two feet fix inches. The diftance of the two lucid points was *about* three inches, for I will not pretend to *extreme* nicety in this obfervation, on account of the very great power I ufed, which was 6450. From thefe meafures we have the magnified angle 38 10'': this divided by the power gives 0''.355 for the apparent diameter of α Lyræ. The fcale of the micrometer, on this occafion, was no lefs than 8.443 inches to a fecond, as will be found by multiplying the natural tangent of a fecond with the power and radius in inches.

"November 28. 1781, I meafured the diameter of the new ftar; but the air was not very favourable, for this fingular ftar was not fo diftinct with 227 that evening as it generally is with 460: therefore, without laying much ftrefs upon the exactnefs of the obfervation, I fhall only report it to exemplify the ufe of the micrometer. My radius was 35 feet 11 inches. The diameter of the ftar, by the diftance of the lucid points, was 2.4 inches, and the power I ufed 227: hence the magnified angle is found 19', and the real diameter of the ftar 5''.022. The fcale of this meafure .474 millefimals of an inch, or almoft half an inch to a fecond."

In the Philofophical Tranfactions for 1791, a very fimple micrometer for meafuring fmall angles with the telefcope is defcribed by Mr Cavallo; who introduces his defcription with the following obfervations upon the different forts of telefcopical micrometers in ufe. "Thefe inftruments may be divided into two claffes; namely, thofe which have not, and thofe which have, fome movement amongft their parts. The micrometers of the former fort confift moftly of fine wires or hairs, varioufly difpofed, and fituated within the telefcope, juft where the image of the object is formed. In order to determine an angle with thofe micrometers, a good deal of calculation is generally required. The micrometers of the other fort, of which there is a great variety, fome being made with moveable parallel wires, others with prifms, others again with a combination of lenfes, and fo on, are more or lefs fubject to feveral inconveniencies, the principal of which are the following. 1. Their motions generally depend upon the action of a fcrew; and of courfe the imperfections of its threads, and the greater or lefs quantity of loft motion, which is obfervable in moving a fcrew, efpecially when fmall, occafion a confiderable error in the menfuration of angles. 2. Their complication and bulk renders them difficultly applicable to a variety of telefcopes, efpecially to the pocket ones. 3. They do not meafure the angle without fome lofs of time, which is neceffary to turn the

 fcrew,

fcrew, or to move fome other mechanifm. 4. and laftly, They are confiderably expenfive, fo that fome of them coft even more than a tolerably good telefcope."

After having had long in view (our author informs us) the conftruction of a micrometer which might be in part at leaft, if not entirely, free from all thofe objections; he, after various attempts, at laft fucceeded with a fimple contrivance, which, after repeated trials, has been found to anfwer the defired end, not only from his own experience, but from that alfo of feveral friends, to whom it has been communicated.

This micrometer, in fhort, confifts of a thin and narrow flip of mother-of-pearl finely divided, and fituated in the focus of the eye-glafs of a telefcope, juft where the image of the object is formed. It is immaterial whether the telefcope be a refractor or a reflector, provided the eye-glafs be a convex lens, and not a concave one as in the Galilean conftruction.

The fimpleft way of fixing it is to ftick it upon the diaphragm which generally ftands within the tube and in the focus of the eye-glafs. When thus fixed, if you look through the eye-glafs, the divifions of the micrometrical fcale will appear very diftinct, unlefs the diaphragm is not exactly in the focus; in which cafe, the micrometrical fcale muft be placed exactly in the focus of the eye-glafs, either by pufhing the diaphragm backwards or forwards, when that is practicable; or elfe the fcale may be eafily removed from one or the other furface of the diaphragm by the interpofition of a circular piece of paper or card, or by a bit of wax. This conftruction is fully fufficient, when the telefcope is always to be ufed by the fame perfon; but when different perfons are to ufe it, then the diaphragm which fupports the micrometer muft be conftructed fo as to be eafily moved backwards or forwards, though that motion needs not be greater than about a tenth or an eighth of an inch. This is neceffary, becaufe the diftance of the focus of the fame lens appears different to the eyes of different perfons; and, therefore, whoever is going to ufe the telefcope for the menfuration of any angle, muft firft of all unfcrew the tube which contains the eye-glafs and micrometer from the reft of the telefcope, and, looking through the eye-glafs, muft place the micrometer where the divifions of it may appear quite diftinct to his eye.

In cafe that any perfon fhould not like to fee always the micrometer in the field of the telefcope, then the micrometrical fcale, inftead of being fixed to the diaphragm, may be fitted to a circular perforated plate of brafs, wood, or even paper, which may be occafionally placed upon the faid diaphragm.

Mr Cavallo has made feveral experiments to determine the moft ufeful fubftance for this micrometer.—Glafs, which he had fuccefsfully applied for a fimilar purpofe to the compound microfcope, feemed at firft to be the moft promifing; but it was at laft rejected after feveral trials: for the divifions upon it generally are either too fine to be perceived, or too rough; and though with proper care and attention the divifions may be proportioned to the fight, yet the thicknefs of the glafs itfelf obftructs in fome meafure the diftinct view of the object. Ivory, horn, and wood, were found ufelefs for the conftruction of this micrometer, on account of their bending, fwelling, and contracting very eafily; whereas mother-of-pearl is a very fteady fubftance, the divifions upon it may be marked very eafily, and when it is made as thin as common writing paper it has a very ufeful degree of tranfparency.

Micrometer.

Fig. 19. exhibits this micrometer fcale, but fhows it four times larger than the real fize of one, which he has adapted to a three-feet achromatic telefcope that magnifies about 84 times. It is fomething lefs than the 24th part of an inch broad; its thicknefs is equal to that of common writing paper; and the length of it is determined by the aperture of the diaphragm, which limits the field of the telefcope. The divifions upon it are the 200ths of an inch, which reach from one edge of the fcale to about the middle of it, excepting every fifth and tenth divifion, which are longer. The divided edge of it paffes through the centre of the field of view, though this is not a neceffary precaution in the conftruction of this micrometer. Two divifions of the above defcribed fcale in my telefcope are very nearly equal to one minute; and as a quarter of one of thofe divifions may be very well diftinguifhed by eftimation, therefore an angle of one eighth part of a minute, or of $7''\frac{1}{2}$, may be meafured with it.

When a telefcope magnifies more, the divifions of the micrometer muft be more minute; and Mr Cavallo finds, that when the focus of the eye-glafs of the telefcope is fhorter than half an inch, the micrometer may be divided with the 500ths of an inch; by means of which, and the telefcope magnifying about 200 times, one may eafily and accurately meafure an angle fmaller than half a fecond. On the other hand, when the telefcope does not magnify above 30 times, the divifions need not be fo minute: for inftance, in one of Dollond's pocket telefcopes, which when drawn out for ufe is about 14 inches long, a micrometer with the hundredths of an inch is quite fufficient, and one of its divifions is equal to little lefs than three minutes, fo that an angle of a minute may be meafured by it.

"In looking through a telefcope furnifhed with fuch a micrometer (fays our author), the field of view appears divided by the micrometer fcale, the breadth of which occupies about one-feventh part of the aperture; and as the fcale is femitranfparent, that part of the object which happens to be behind it may be difcerned fufficiently well to afcertain the divifion, and even the quarter of a divifion, with which its borders coincide. Fig. 20. fhows the appearance of the field of my telefcope with the micrometer, when directed to the title page of the Philofophical Tranfactions, wherein one may obferve that the thicknefs of the letter C is equal to three-fourths of a divifion, the diameter of the O is equal to three divifions, and fo on.

"At firft view, one is apt to imagine, that it is difficult to count the divifions which may happen to cover or to meafure an object; but upon trial it will be found, that this is readily performed; and even people who have never been ufed to obferve with the telefcope,

Micrometer.

ſcope, ſoon learn to meaſure very quickly and accurately with this micrometer; for ſince every fifth and tenth diviſion is longer than the reſt, one ſoon acquires the habit of ſaying, five, ten, fifteen; and then, by adding the other diviſions leſs than five, completes the reckoning. Even with a teleſcope which has no ſtand, if the object end of it be reſted againſt a ſteady place, and the other end be held by the hand near the eye of the obſerver, an object may be meaſured with accuracy ſufficient for ſeveral purpoſes, as for the eſtimation of ſmall diſtances, for determining the height of a houſe, &c.

"After having conſtructed and adapted this micrometer to the teleſcope, it is then neceſſary to aſcertain the value of the diviſions. It is hardly neceſſary to mention in this place, that though thoſe diviſions meaſure the chords of the angles, and not the angles or arches themſelves, and the chords are not as the arches, yet it has been ſhown by all the trigonometrical writers, that in ſmall angles the chords, arches, ſines, and tangents, follow the ſame proportion ſo very nearly, that the very minute difference may be ſafely neglected: ſo that if one diviſion of this micrometer is equal to one minute, we may ſafely conclude, that two diviſions are equal to two minutes, three diviſions to three minutes, and ſo on. There are various methods of aſcertaining the value of the diviſions of ſuch a micrometer, they being the very ſame that are uſed for aſcertaining the value of the diviſions in other micrometers. Such are, the paſſage of an equatorial ſtar over a certain number of diviſions in a certain time; or the meaſuring of the diameter of the ſun, by computation from the focal diſtance of the object and other lenſes of the teleſcope; the laſt of which, however, is ſubject to ſeveral inaccuracies; but as they are well known to aſtronomical perſons, and have been deſcribed in many books, they need not be farther noticed here. However, for the ſake of workmen and other perſons not converſant in aſtronomy, I ſhall deſcribe an eaſy and accurate method of aſcertaining the value of the diviſions of the micrometer.

"Mark upon a wall or other place the length of ſix inches, which may be done by making two dots or lines ſix inches aſunder, or by fixing a ſix-inch ruler upon a ſtand; then place the teleſcope before it ſo that the ruler or ſix-inch length may be at right angles with the direction of the teleſcope, and juſt 57 feet $3\frac{1}{2}$ inches diſtant from the object glaſs of the teleſcope: this done, look through the teleſcope at the ruler or other extenſion of ſix inches, and obſerve how many diviſions of the micrometer are equal to it, and that ſame number of diviſions is equal to half a degree, or 30′; and this is all that needs be done for the required determination; the reaſon of which is, becauſe an extenſion of ſix inches ſubtends an angle of 30 at the diſtance of 57 feet $3\frac{1}{2}$ inches, as may be eaſily calculated by the rules of plane trigonometry

"In one of Dollond's 14-inch pocket teleſcopes, if the diviſions of the micrometer be the hundredths of an inch, $11\frac{1}{2}$ of thoſe diviſions will be found equal to 30′, or 23 to a degree. When this value has been once aſcertained, any other angle meaſured by any other number of diviſions is determined by the rule of three. Thus, ſuppoſe that the diameter of the ſun ſeen through the ſame teleſcope, be found equal to 12 diviſions, ſay as $11\frac{1}{2}$ diviſions are to 30 minutes, ſo are 12 diviſions to $\left(\frac{12 \times 30'}{11.5}\right)$ 31′.3, which is the required diameter of the ſun.

"Notwithſtanding the facility of this calculation, a ſcale may be made anſwering to the diviſions of a micrometer, which will ſhow the angle correſponding to any number of diviſions to mere inſpection. Thus, for the above-mentioned ſmall teleſcope, the ſcale is repreſented in fig. 21. AB is a line drawn at pleaſure; it is then divided into 23 equal parts, and thoſe diviſions which repreſent the diviſions of the micrometer that are equal to one degree, are marked on one ſide of it. The line then is divided again into 60 equal parts, which are marked on the other ſide of it; and theſe diviſions repreſent the minutes which correſpond to the diviſions of the micrometer: thus the figure ſhows, that ſix diviſions of the micrometer are equal to $15\frac{1}{2}$ minutes, $11\frac{1}{2}$ diviſions are nearly equal to 29 minutes, &c. What has been ſaid of minutes may be ſaid of ſeconds alſo, when the ſcale is to be applied to a large teleſcope.

"Thus far this micrometer and its general uſe have been ſufficiently deſcribed; and mathematical perſons may eaſily apply it to the various purpoſes to which micrometers have been found ſubſervient. But as the ſimplicity, cheapneſs, and at the ſame time the accuracy of this contrivance, may render the uſe of it much more general than that of any other micrometer; and I may venture to ſay, that it will be found very uſeful in the army, and amongſt ſea-faring people, for the determination of diſtances, heights, &c.; I ſhall therefore join ſome practical rules to render this micrometer uſeful to perſons unacquainted with trigonometry and the uſe of logarithms.

"Problem I. The angle, not exceeding one degree, which is ſubtended by an extenſion of one foot, being given, to find its diſtance from the place of obſervation. *N. B.* This extenſion of one foot, or any other which may be mentioned hereafter, muſt be perpendicular to the direction of the teleſcope through which it is obſerved. The diſtances are reckoned from the object-glaſs of the teleſcope; and the anſwers obtained by the rules of this problem, though not exactly true, are however ſo little different from the truth, that the difference ſeldom amounts to more than two or three inches, which may be ſafely neglected.

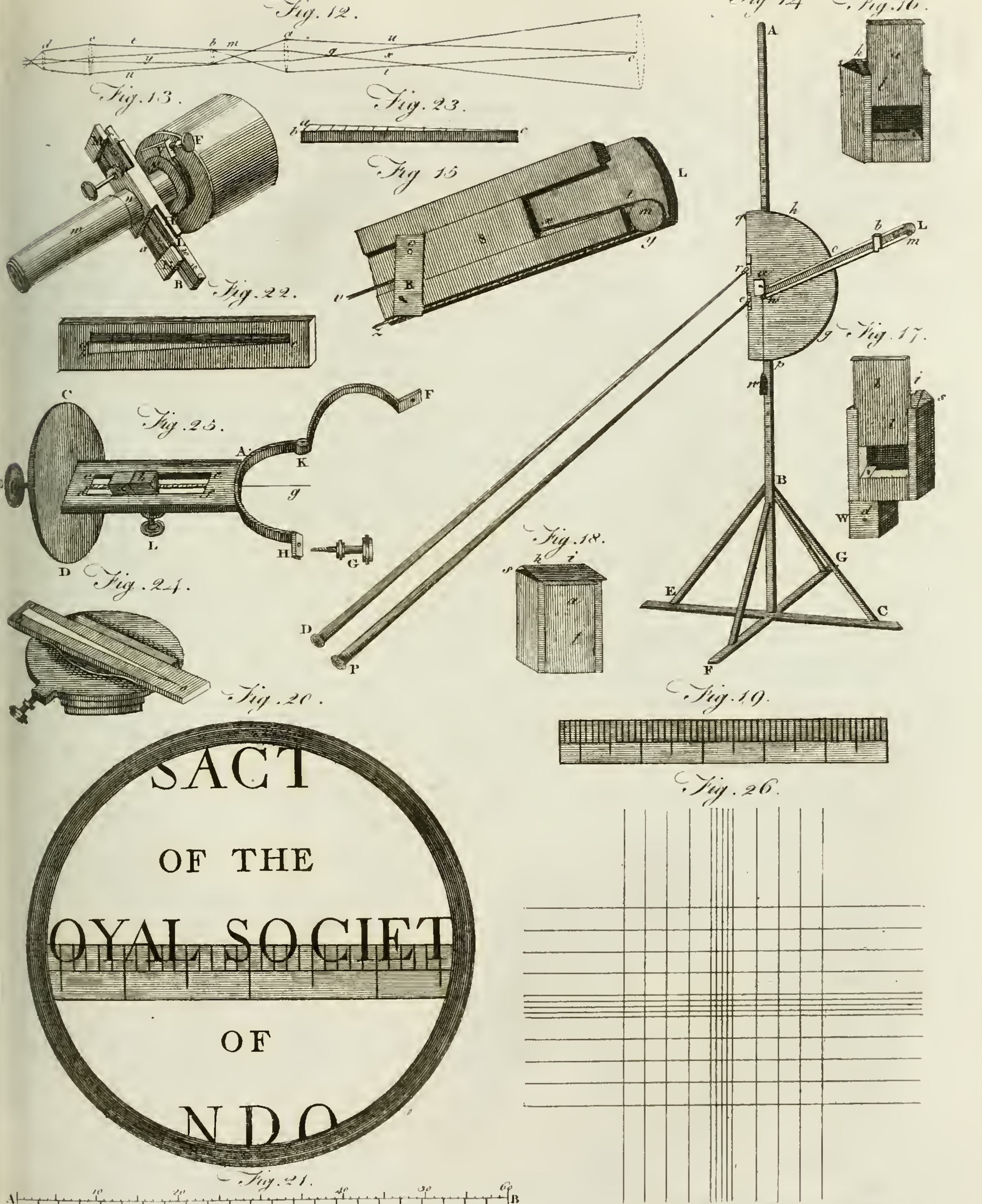
"Rule 1. If the angle be expreſſed in minutes, ſay, as the given angle is to 60, ſo is 687.55 to a fourth proportional, which gives the anſwer in inches.—2. If the angle be expreſſed in ſeconds, ſay, as the given angle is to 3600, ſo is 687.55 to a fourth proportional, which expreſſes the anſwer in inches.—3. If the angle be expreſſed in minutes and ſeconds, turn it all into ſeconds, and proceed as above.

"Example. At what diſtance is a globe of one foot in diameter when it ſubtends an angle of two ſeconds?

$$2 : 3600 :: 687{,}55 : \frac{3600 \times 687.55}{2} = 123759$$

inches, or $10313\frac{1}{4}$ feet, which is the anſwer required.

This



A. Bell Prin. Wal. Sculptor fecit.

"This calculation may be shortened; for since two of the three proportionals are fixed, their product in the first case is 41253, and in the other two cases is 2475180; so that in the first case, viz. when the angle is expressed in minutes, you need only divide 41253 by the given angle; and in the other two cases, viz. when the angle is expressed in seconds, divide 2475180 by the given angle, and the quotient in either case is the answer in inches.

"Problem II. The angle, not exceeding one degree, which is subtended by any known extension, being given, to find its distance from the place of observation.

"Rule. Proceed as if the extension were of one foot by Problem I. and call the answer B; then, if the extension in question be expressed in inches, say, as 12 inches are to that extension, so is B to a fourth proportional, which is the answer in inches; but if the extension in question be expressed in feet, then you need only multiply it by B, and the product is the answer in inches.

"Example. At what distance is a man six feet high, when he appears to subtend an angle of 30″.

"By problem I. if the man were one foot high, the distance would be 82506 inches; but as he is six feet high, therefore multiply 82506 by 6, and the product gives the required distance, which is 495036 inches, or 41253 feet.

"For greater conveniency, especially in travelling, or in such circumstances in which one has not the opportunity of making even the easy calculations required in those problems, I have calculated the following two tables; the first of which shows the distance answering to any angle from one minute to one degree, which is subtended by an extension of one foot; and the second table shows the distance answering to any angle from one minute to one degree, which is subtended by a man, the height of which has been called an extension of six feet; because, at a mean, such is the height of a man when dressed with hat and shoes on. These tables may be transcribed on a card, and may be had always ready with a pocket telescope furnished with a micrometer. Their use is evidently to ascertain distances without any calculation; and they are calculated only to minutes, because with a pocket telescope and micrometer it is not possible to measure an angle more accurately than to a minute.

"Thus, if one wants to measure the extension of a street, let a foot ruler be placed at the end of the street; measure the angular appearance of it, which suppose to be 36′, and in the table you will have the required distance against 36′, which is $95\frac{1}{2}$ feet. Thus also a man who appears to be 49′ high, is at the distance of 421 feet.

Angles subtended by an extension of one foot at different distances.

Angles.	Distances in feet.	Angles.	Distances in feet.
Min. 1	3437,7	Min. 31	110,9
2	1718,9	32	107,4
3	1145,9	33	104,2
4	859,4	34	101,1
5	687,5	35	98,2
6	572,9	36	95,5
7	491,1	37	92,9
8	429,7	38	90,4
9	382,0	39	88,1
10	343,7	40	85,9
11	312,5	41	83,8
12	286,5	42	81,8
13	264,4	43	79,9
14	245,5	44	78,1
15	229,2	45	76,4
16	214,8	46	74,7
17	202,2	47	73,1
18	191,0	48	71,6
19	180,9	49	70,1
20	171,8	50	68,7
21	162,7	51	67,4
22	156,2	52	66,1
23	149,4	53	64,8
24	143,2	54	63,6
25	137,5	55	62,5
26	132,2	56	61,4
27	127,3	57	60,3
28	122,7	58	59,2
29	118,5	59	58,2
30	114,6	60	57,3

Angles subtended by an extension of six feet at different distances.

Angles.	Distances in feet.	Angles.	Distances in feet.
Min. 1	20626,8	Min. 31	665,4
2	10313.	32	644,5
3	6875,4	33	625.
4	5156,5	34	606,6
5	4125,2	35	589,3
6	3437,7	36	572,9
7	2946,6	37	557,5
8	2578,2	38	542,8
9	2291,8	39	528,9
10	2062,6	40	515,6
11	1875,2	41	503,1
12	1718,8	42	491,1
13	1586,7	43	479,7
14	1473,3	44	468,8
15	1375.	45	458,4
16	1298,1	46	448,4
17	1213,3	47	438,9
18	1145,9	48	429,7
19	1085,6	49	421.
20	1031,4	50	412,5
21	982,2	51	404,4
22	937,6	52	396,7
23	896,8	53	389,2
24	859,4	54	381,9
25	825.	55	375.
26	793,3	56	368,3
27	763,9	57	361,9
28	736,6	58	355,6
29	711,3	59	349,6
30	687,5	60	343,7

II. The Micrometer has not only been applied to telescopes, and employed for astronomical purposes; but there have also been various contrivances for adapting it to MICROSCOPICAL observations. Mr Leeuwenhoek's method of estimating the size of small objects was by comparing them with grains of sand, of which 100 in a line took up an inch. These grains he laid upon the same plate with his objects, and viewed them at the same time. Dr Jurin's method was similar to this; for he found the diameter of a piece of fine silver wire, by wrapping it as close as he could about a pin, and observing how many rings made an inch; and he used this wire in the same manner as Leeuwenhoek used his sand. Dr Hooke used to look upon the magnified object with one eye, while at the same time he viewed other objects placed at the same distance with the other eye. In this manner he was able, by the help of a ruler, divided into inches and small parts, and laid on the pedestal of the microscope, to cast as it were the magnified appearance of the object upon the ruler, and thus exactly to measure the diameter which it appeared to have through the glass; which being compared with the diameter as it appeared to the naked eye, easily showed the degree in which it was magnified. A little practice, says Mr Baker, will render this method exceedingly easy and pleasant.

Mr Martin in his Optics recommended such a micrometer for a microscope as had been applied to telescopes: for he advises to draw a number of parallel lines on a piece of glass, with the fine point of a diamond, at the distance of one-fortieth of an inch from one another, and to place it in the focus of the eye-glass. By this method, Dr Smith contrived to take the exact draught of objects viewed by a double microscope; for he advises to get a lattice, made with small silver wires or squares, drawn upon a plain glass by the strokes of a diamond, and to put it into the place of the image, formed by the object-glass: then by transferring the parts of the object, seen in the squares of the glass or lattice upon similar corresponding squares drawn on paper, the picture may be exactly taken. Mr Martin also introduced into compound microscopes another micrometer, consisting of a screw. See both these methods described in his *Optics*, p. 277.

The mode of actual admeasurement (Mr Adams observes *) is without doubt the most simple that can be used; as by it we comprehend, in a manner, at one glance, the different effects of combined glasses; and as it saves the trouble, and avoids the obscurity, of the usual modes of calculation: but many persons find it exceedingly difficult to adopt this method, because they have not been accustomed to observe with both eyes at once. To obviate this inconvenience, the late Mr Adams contrived an instrument called the *Needle-Micrometer*, which was first described in his *Micrographia Illustrata;* and of which, as now constructed, we have the following description by his son Mr George Adams in the ingenious Essays above quoted.

* *Microscopical Essays*, p. 59.

This micrometer consists of a screw, which has 50 threads to an inch; this screw carries an index, which points to the divisions on a circular plate, which is fixed at right angles to the axis of the screw. The revolutions of the screw are counted on a scale, which is an inch divided into 50 parts; the index to these divisions is a flower-de-luce marked upon the slider, which carries the needle point across the field of the microscope. Every revolution of the micrometer screw measures $\frac{1}{50}$th part of an inch, which is again subdivided by means of the divisions on the circular plate, as this is divided into 20 equal parts, over which the index passes at every revolution of the screw; by which means we obtain with ease the measure of 1000th part of an inch: for 50, the number of threads on the screw in one inch, being multiplied by 20, the divisions on the circular plate are equal to 1000; so that each division on the circular plate shows that the needle has either advanced or receded 1000th part of an inch.

To place this micrometer on the body of the microscope, open the circular part FKH, fig. 25. by taking out the screw G, throw back the semicircle FK, which moves upon a joint at K; then turn the sliding tube of the body of the microscope, so that the small holes which are in both tubes may exactly coincide, and let the needle *g* of the micrometer have a free passage through them; after this, screw it fast upon the body by the screw G. The needle will now traverse the field of the microscope, and measure the length and breadth of the image of any object that is applied to it. But further assistance must be had, in order to measure the object itself, which is a subject of real importance; for though we have ascertained the power of the microscope, and know that it is so many thousand times, yet this will be of little assistance towards ascertaining an accurate idea of its real size; for our ideas of bulk being formed by the comparison of one object with another, we can only judge of that of any particular body, by comparing it with another whose size is known: the same thing is necessary, in order to form an estimate by the microscope; therefore, to ascertain the real measure of the object, we must make the point of the needle pass over the image of a known part of an inch placed on the stage, and write down the revolutions made by the screw, while the needle passed over the image of this known measure; by which means we ascertain the number of revolutions on the screw, which are adequate to a real and known measure on the stage. As it requires an attentive eye to watch the motion of the needle point as it passes over the image of a known part of an inch on the stage, we ought not to trust to one single measurement of the image, but ought to repeat it at least six times; then add the six measures thus obtained together, and divide their sum by six, or the number of trials; the quotient will be the mean of all the trials. This result is to be placed in a column of a table next to that which contains the number of the magnifiers.

Pl. CCX.

By the assistance of the sectoral scale, we obtain with ease a small part of an inch. This scale is shown at fig. 22, 23, 24, in which the two lines *ca*, *cb*, with the side *ab*, form an isosceles triangle; each of the sides is two inches long, and the base still only of one-tenth of an inch. The longer sides may be of any given length, and the base still only of one-tenth of an inch. The longer lines may be considered as the line of lines upon a sector opened to one-tenth of an inch. Hence whatever number of equal parts *ca*, *cb* are divided into, their transverse measure will be such a part of one-tenth as is expressed by their divisions. Thus if it be divided into ten equal parts, this will divide the

the inch into 100 equal parts; the first division next *c* will be equal to 100th part of an inch, because it is the tenth part of one-tenth of an inch. If these lines are divided into twenty equal parts, the inch will be by that means divided into 200 equal parts. Lastly, if *ab*, *ca*, are made three inches long, and divided into 100 equal parts, we obtain with ease the 1000th part. The scale is represented as solid at fig. 23. but as perforated at fig. 22. and 24. so that the light passes thro' the aperture, when the sectoral part is placed on the stage.

To use this scale, first fix the micrometer, fig. 25. to the body of the microscope; then fit the sectoral scale, fig. 24. in the stage, and adjust the microscope to its proper focus or distance from the scale, which is to be moved till the base appears in the middle of the field of view; then bring the needle point *g*, fig. 25. (by turning the screw L) to touch one of the lines *ca*, exactly at the point answering to 20 on the sectoral scale. The index *a* of the micrometer is to be set to the first division, and that on the dial plate to 20, which is both the beginning and end of its divisions; we are then prepared to find the magnifying power of every magnifier in the compound microscope which we are using.

Example. Every thing being prepared agreeable to the foregoing directions, suppose you are desirous of ascertaining the magnifying power of the lens marked N° 4. turn the micrometer screw until the point of the needle has passed over the magnified image of the tenth part of one inch; then the division, where the two indices remain, will show how many revolutions, and parts of a revolution, the screw has made, while the needle point traversed the magnified image of the one-tenth of an inch; suppose the result to be 26 revolutions of the screw, and 14 parts of another revolution, this is equal to 26 multiplied by 20, added to 14; that is, 534,000 parts of an inch.—The 26 divisions found on the straight scale of the micrometer, while the point of the needle passed over the magnified image of one-tenth part of an inch, were multiplied by 20, because the circular plate CD, fig. 25. is divided into 20 equal parts; this produced 520; then adding the 14 parts of the next revolution, we obtain the 534,000 parts of an inch, or five-tenths and 3400 parts of another tenth, which is the measure of the magnified image of one-tenth of an inch, at the aperture of the eye-glasses or at their foci. Now if we suppose the focus of the two eye-glasses to be one inch, the double thereof is two inches; or if we reckon in the 1000th part of an inch, we have 2000 parts for the distance of the eye from the needle point of the micrometer. Again, if we take the distance of the image from the object at the stage at 6 inches, or 6000, and add thereto 2000, double the distance of the focus of the eye-glass, we shall have 8000 parts of an inch for the distance of the eye from the object; and as the glasses double the image, we must double the number 534 found upon the micrometer, which then makes 1068: then, by the following analogy, we shall obtain the number of times the microscope magnifies the diameter of the object; say, as 240, the distance of the eye from the image of the object, is to 800, the distance of the eye from the object; so is 1068, double the measure found on the micrometer, to 3563, or the number of times the microscope magnifies the diameter of the object. By working in this manner, the magnifying power of each lens used with the compound microscope may be easily found, though the result will be different in different compound microscopes, varying according to the combination of the lenses, their distance from the object and one another, &c.

Having discovered the magnifying power of the microscope, with the different object-lenses that are used therewith, our next subject is to find out the real size of the objects themselves, and their different parts: this is easily effected, by finding how many revolutions of the micrometer-screw answer to a known measure on the sectoral scale or other object placed on the stage; from the number thus found, a table should be constructed, expressing the value of the different revolutions of the micrometer with that object lens, by which the primary number was obtained. Similar tables must be constructed for each object lens. By a set of tables of this kind, the observer may readily find the measure of any object he is examining; for he has only to make the needle point traverse over this object, and observe the number of revolutions the screw has made in its passage, and then look into his table for the real measure which corresponds to this number of revolutions, which is the measure required.

Mr Coventry of Southwark has favoured us with the description of a micrometer of his own invention; the scale of which, for minuteness, surpasses every instrument of the kind of which we have any knowledge, and of which, indeed, we could scarcely have formed a conception, had he not indulged us with several of these instruments, graduated as underneath.

The micrometer is composed of glass, ivory, silver, &c. on which are drawn parallel lines from the 10th to the 10,000th part of an inch. But an instrument thus divided, he observes, is more for curiosity than use: but one of those which Mr Coventry has sent us is divided into squares, so small that sixteen million of them are contained on the surface of one square inch, each square appearing under the microscope true and distinct; and though so small, it is a fact, that animalcula are found which may be contained in one of these squares.

The use of micrometers, when applied to microscopes, is to measure the natural size of the object, and how much that object is magnified. To ascertain the real size of an object in the single microscope, nothing more is required than to lay it on the micrometer, and adjust it to the focus of the magnifier, noticing how many divisions of the micrometer it covers. Suppose the parallel lines of the micrometer to be the 1000th of an inch, and the object covers two divisions; its real size is 500ths of an inch; if five, 200ths, and so on.

But to find how much the object is magnified, is not mathematically determined so easy by the single as by the compound microscope: but the following simple method (says Mr Coventry) I have generally adopted, and think it tolerably accurate. Adjust a micrometer under the microscope *o*, say the 100th of an inch of divisions, with a small object on it; if square, the better: notice how many divisions one side of the object covers, suppose 10: then cut a piece

of

Micrometer.

of white paper something larger than the magnified appearance of the object: then fix one eye on the object through the microscope, and the other at the same time on the paper, lowering it down till the object and the paper appear level and distinct: then cut the paper till it appear exactly the size of the magnified object; the paper being then measured, suppose an inch square: Now, as the object under the magnifier, which appeared to be one inch square, was in reality only ten hundredths, or the tenth of an inch, the experiment proves that it is magnified ten times in length, one hundred times in superfices, and one thousand times in cube, which is the magnifying power of the glass; and, in the same manner, a table may be made of the power of all the other glasses.

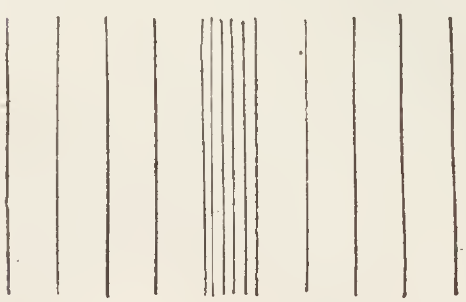
In using the compound microscope, the real size of the object is found by the same method as in the single: but to demonstrate the magnifying power of each glass to greater certainty, adopt the following method.—Lay a two-feet rule on the stage, and a micrometer level with its surface (an inch suppose, divided into 100 parts): with one eye see how many of those parts are contained in the field of the microscope, (suppose 50); and with the other, at the same time, look for the circle of light in the field of the microscope, which with a little practice will soon appear distinct; mark how much of the rule is intersected by the circle of light, which will be half the diameter of the field. Suppose eight inches; consequently the whole diameter will be sixteen. Now, as the real size of the field, by the micrometers, appeared to be only 50 hundredths, or half an inch, and as half an inch is only one 32d part of 16 inches, it shows the magnifying power of the glass to be 32 times in length, 1024 superfices, and 32,768 cube (E).

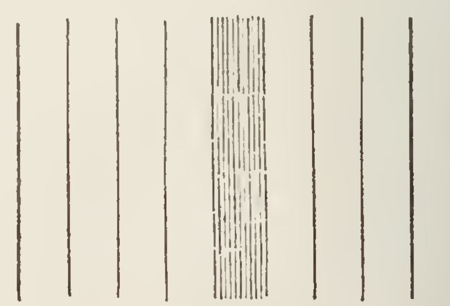
Another way of finding the magnifying power of compound microscopes, is by using two micrometers of the same divisions; one adjusted under the magnifier, the other fixed in the body of the microscope in the focus of the eye-glass. Notice how many divisions of the micrometer in the body are seen in one division of the micrometer under the magnifier, which again must be multiplied by the power of the eye-glass. Example: Ten divisions of the micrometer in the body are contained in one division under the magnifier; so far the power is increased ten times: now, if the eye-glass be one inch focus, such glass will of itself magnify about eight times in length, which, with the ten times magnified before, will be eight times ten, or 80 times in length, 6400 superficies, and 512,000 cube.

"If (says Mr Coventry) these micrometers are employed in the solar microscope, they divide the object into squares on the screen in such a manner as to render it extremely easy to make a drawing of it. And (says he) I apprehend they may be employed to great advantage with such a microscope as Mr Adams's Lucernal; because this instrument may be used either by day or night, or in any place, and gives the actual magnifying power without calculation."

The case with which we have been favoured by Mr Coventry contains six micrometers, two on ivory and four on glass. One of those on ivory is an inch divided into one hundred parts, every fifth line longer than the intermediate one, and every tenth longer still, for the greater ease in counting the divisions under the microscope, and is generally used in measuring the magnifying power of microscopes. The other ivory one is divided into squares of the 50th and 100th of an inch, and is commonly employed in measuring opaque objects.

Those made of glass are for transparent objects, which, when laid on them, show their natural size.—That marked on the brass 100, are squares divided to the 100th of an inch: that marked 5000 are parallel lines forming nine divisions, each division the 1000th of an inch; the middle division is again divided into 5, making divisions to the 5000th of an inch. That marked 10,000 is divided in the same manner, with the middle division divided into 10, making the 10,000th of an inch. Example:





The glass micrometer without any mark is also divided, the outside lines into 100th, the next into 1000th, and the inside lines into the 4000th of an inch: these are again crossed with an equal number of lines in the same manner, making squares of the 100th, 1000th, and 4000th of an inch, thus demonstrating each other's size. The middle square of the 100th of an inch (see fig. 26.) is divided into sixteen squares; now

(E) It will be necessary, for great accuracy, as well as for comparative observations, that the two-feet rule should always be placed at a certain distance from the eye: eight inches would, in general, be a proper distance.

A. Bell Prin. Wal. Sculptor fecit.

now as 1000 fquares in the length of an inch, multiplied by 1000, gives one million in an inch furface; by the fame rule, one of thofe fquares divided into 16 muft be the fixteen millionth part of an inch furface. See fig. 26. which is a diminifhed view of the apparent furface exhibited under the magnifier n° 1 of Wilfon's microfcope. In viewing the fmalleft lines, Mr Coventry ufes n° 2. or 3.; and they are all better feen, he fays, by candle than by day-light.

MICROPUS, BASTARD CUDWEED: A genus of the polygamia neceffaria order, belonging to the fyngenefia clafs of plants; and in the natural method ranking under the 49th order, *Compofitæ*. The receptacle is paleaceous; there is no pappus; the calyx is calyculated; there is no radius of the corolla. The female florets are wrapped in the fcales of the calyx. There are two fpecies, the fupinus and erectus; but only the former is ever cultivated in gardens. It is an annual plant, growing naturally in Portugal, in places near the fea. The root fends out feveral trailing ftalks, about fix or eight inches long, which are garnifhed with fmall, oval, filvery leaves, whofe bafes embrace the ftalks. The flowers come out in clufters from the wings of the ftalks, and are very fmall, and of a white colour. It flowers in June and July; and is frequently preferved in gardens on account of the beauty of its filvery leaves. It is eafily propagated by feed fown in autumn, and requires no other culture but to be kept free from weeds.

MICROSCOPE, an optical inftrument, confifting of lenfes, or mirrors, by means of which fmall objects appear larger than they do to the naked eye. *Single* microfcopes confift of a fingle lens or mirror; or if more lenfes or mirrors be made ufe of, they only ferve to throw light upon the object, but do not contribute to enlarge the image of it. *Double* or *compound* microfcopes are thofe in which the image of an object is compofed by means of more lenfes or mirrors than one.

For the principles on which the conftruction of microfcopes depends, fee OPTICS. In the prefent article, it is intended to defcribe the finifhed inftrument, with all its varied apparatus, according to the lateft improvements; and to illuftrate by proper details its ufes and importance.

I. *Of* SINGLE *Microfcopes.*

THE famous microfcopes made ufe of by Mr Leewenhoeck, were all, as Mr Baker affures us, of the fingle kind, and the conftruction of them was the moft fimple poffible; each confifting only of a fingle lens fet between two plates of filver, perforated with a fmall hole, with a moveable pin before it to place the object on and adjuft it to the eye of the beholder. He informs us alfo, that *lenfes* only, and not *globules*, were ufed in every one of thefe microfcopes.

Plate CXCVII. f. 1. 1. The fingle microfcope now moft generally known and ufed is that called *Wilfon's Pocket Microfcope.* The body is made of brafs, ivory, or filver, and is reprefented by AA, BB. CC is a long fine-threaded male fcrew that turns into the body of the microfcope; D a convex glafs at the end of the fcrew. Two concave round pieces of thin brafs, with holes of different diameters in the middle of them, are placed to cover the abovementioned glafs, and thereby diminifh the aperture when the greateft magnifiers are employed. EE, three thin plates of brafs within the body of the microfcope; one of which is bent femicircularly in the middle, fo as to form an arched cavity for the reception of a tube of glafs, the ufe of the other two being to receive and hold the fliders between them. F, a piece of wood or ivory, arched in the manner of the femicircular plate, and cemented to it. G, the other end of the body of the microfcope, where a hollow female fcrew is adapted to receive the different magnifiers. H, is a fpiral fpring of fteel, between the end G and the plates of brafs, intended to keep the plates in a right pofition and counteract the long fcrew CC. I, is a fmall turned handle, for the better holding of the inftrument, to fcrew on or off at pleafure.

To this microfcope belong fix or feven magnifying glaffes: fix of them are fet in filver, brafs, or ivory, as in the figure K; and marked 1, 2, 3, 4, 5, 6, the loweft numbers being the greateft magnifiers. L is the feventh magnifier, fet in the manner of a little barrel, to be held in the hand for the viewing of any larger object. M, is a flat flip of ivory, called a *flider*, with four round holes through it, wherein to place objects between two pieces of glafs or Mufcovy talc, as they appear at *dddd*. Six fuch fliders, and one of brafs, are ufually fold with this microfcope, fome with objects placed in them, and others empty for viewing any thing that may offer: but whoever pleafes to make a collection, may have as many as he defires. The brafs flider is to confine any fmall object, that it may be viewed without crufhing or deftroying it. N, is a tube of glafs contrived to confine living objects, fuch as frogs, fifhes, &c. in order to difcover the circulation of the blood. All thefe are contained in a little neat box of fifh-fkin or mahogany, very convenient for carrying in the pocket.

When an object is to be viewed, thruft the ivory flider, in which the faid object is placed, between the two flat brafs plates EE: obferving always to put that fide of the flider where the brafs rings are fartheft from the eye. Then fcrew on the magnifying glafs you intend to ufe, at the end of the inftrument G; and looking through it againft the light, turn the long fcrew CC, till your object be brought to fuit your eye; which will be known by its appearing perfectly diftinct and clear. It is moft proper to look at it firft through a magnifier that can fhow the whole at once, and afterwards to infpect the feveral parts more particularly with one of the greateft magnifiers; for thus you will gain a true idea of the whole, and of all its parts. And though the greateft magnifiers can fhow but a minute portion of any object at once, fuch as the claw of a flea, the horn of a loufe, or the like; yet by gently moving the flider which contains the object, the eye will gradually examine it all over.

As objects muft be brought very near the glaffes when the greateft magnifiers are made ufe of, be careful not to fcratch them by rubbing the flider againft them as you move it in or out. A few turns of the fcrew CC will eafily prevent this mifchief, by giving them room enough. You may change the objects in your fliders for any others you think proper, by taking out the brafs rings with the point of a penknife; the talcs will then fall out, if you but turn the fliders; and

and after putting what you please between them, by replacing the brass rings you will fasten them as they were before. It is proper to have some sliders furnished with talcs, but without any object between them, to be always in readiness for the examination of fluids, salts, sands, powders, the farina of flowers, or any other casual objects of such sort as need only be applied to the outside of the talc.

The circulation of the blood may be easiest seen in the tails or fins of fishes, in the fine membranes between a frog's toes, or best of all in the tail of a water-newt. If your object be a small fish, place it within the tube N, and spread its tail or fin along the side thereof: if a frog, choose such an one as can but just be got into your tube; and, with a pen, or small stick, expand the transparent membrane between the toes of the frog's hind foot as much as you can. When your object is so adjusted that no part of it can intercept the light from the place you intend to view, unscrew the long screw CC, and thrust your tube into the arched cavity, quite through the body of the microscope; then screw it to the true focal distance, and you will see the blood passing along its vessels with a rapid motion, and in a most surprising manner.

The third or fourth magnifiers may be used for frogs or fishes: but for the tails of water-newts, the fifth or sixth will do; because the globules of their blood are twice as large as those of frogs or fish. The first or second magnifier cannot well be employed for this purpose; because the thickness of the tube in which the object lies, will scarce admit its being brought so near as the focal distance of the magnifier.

An apparatus for the purpose of viewing opaque objects generally accompanies this microscope; and which consists of the following parts. A brass arm QR, which is screwed at Q, upon the body of the microscope at G. Into the round hole R, any of the magnifiers suitable to the object to be viewed are to be screwed; and under it, in the same ring, the concave polished silver speculum S. Through a small aperture in the body of the microscope under the brass plates EE, is to slide the long wire with the forceps T: This wire is pointed at one of its ends; and so, that either the points or forceps may be used for the objects as may be necessary. It is easy to conceive, therefore, that the arm at R, which turns by a twofold joint at *a* and *b*, may be brought with its magnifier over the object, the light reflected upon it by the application of the speculum, and the true focus obtained by turning of the male screw CC as before directed.—As objects are sometimes not well fixed for view, either by the forceps or point, the small piece shown at N is added, and in such cases answers better: it screws over the point of T; it contains a small round piece of ivory, blackened on one side, and left white upon the other as a contrast to coloured objects, and by a small piece of watch-spring fastens down the objects upon the ivory.

2. *Single Microscope by reflection.* In fig. 2. A is a scroll of brass fixed upright upon a round wooden base B, or mahogany drawer or case, so as to stand perfectly firm and steady. C is a brass screw, that passes through a hole in the upper limb of the scroll into the side of the microscope D, and screws it fast to the said scroll. E is a concave speculum set in a box of brass, which hangs in the arch G by two small screws *ff*, that screw into the opposite sides thereof. At the bottom of this arch is a pin of the same metal, exactly fitted to a hole *h* in the wooden pedestal, made for the reception of the pin. As the arch turns on this pin, and the speculum turns on the end of the arch, it may, by this twofold motion, be easily adjusted in such a manner as to reflect the light of the sun, of the sky, or of a candle, directly upwards through the microscope that is fixed perpendicularly over it; and by so doing may be made to answer many purposes of the large double reflecting microscope. The body of the microscope may also be fixed horizontally, and objects viewed in that position by any light you choose; which is an advantage the common double reflecting microscope has not. It may also be rendered further useful by means of a slip of glass; one end of which being thrust through between the plates where the sliders go, and the other extending to some distance, such objects may be placed thereon as cannot be applied in the sliders: and then, having a limb of brass that may fasten to the body of the microscope, and extend over the projecting glass a hollow ring wherein to screw the magnifiers, all sorts of subjects may be examined with great convenience, if a hole be made in the pedestal, to place the speculum exactly underneath, and thereby throw up the rays of light. The pocket-microscope, thus mounted, says Mr Baker, "is as easy and pleasant in its use; as fit for the most curious examination of the animalcules and salts in fluids, of the farinæ in vegetables, and of the circulation in small animals; in short, is as likely to make considerable discoveries in objects that have some degree of transparency, as any microscope I have ever seen or heard of."

The brass scroll A is now generally made to unscrew into three parts, and pack with the microscope and apparatus into the drawer of a mahogany pocket-case, upon the lid of which the scroll is made to fix when in use.

The opaque apparatus also, as above described, is applicable this way by reflection. It only consists in turning the arm R (fig. 1.), with the magnifier over the concave speculum below (fig. 2), or to receive the light as reflected obliquely from it: the silver speculum screwed into R will then reflect the light, which it receives from the glass speculum, strongly upon the object that is applied upon the wire T underneath.

This microscope, however, is not upon the most convenient construction, in comparison with others now made: it has been esteemed for many years past from its popular name, and recommendation by its makers. Its portability is certainly a great advantage in its favour; but in most respects it is superseded by the microscopes hereafter described.

Fig. 3.

3. *Microscope for Opaque Objects, called the Single Opaque Microscope.* This microscope remedies the inconvenience of having the dark side of an object next the eye, which formerly was an unsurmountable objection to the making observations on opaque objects with any considerable degree of exactness or satisfaction: for, in all other contrivances commonly known, the nearness of the instrument to the object (when glasses that magnify much are used) unavoidably overshadows it so much, that its appearance is rendered obscure and indistinct. And, notwithstanding ways have

Microscope have been tried to point light upon an object, from the sun or a candle, by a convex glass placed on the side thereof, the rays from either can be thrown upon it in such an acute angle only, that they serve to give a confused glare, but are insufficient to afford a clear and perfect view of the object. But this microscope, by means of a concave speculum of silver highly polished, in whose centre a magnifying lens is placed, such a strong and direct light is reflected upon the object, that it may be examined with all imaginable ease and pleasure. The several parts of this instrument, made either of brass or silver, are as follow.

Through the first side A, passes a fine screw B, the other end of which is fastened to the moveable side C. D is a nut applied to this screw, by the turning of which the two sides A and C are gradually brought together. E is a spring of steel that separates the two sides when the nut is unscrewed. F is a piece of brass, turning round in a socket, whence proceeds a small spring tube moving upon a rivet; through which tube there runs a steel wire, one end whereof terminates in a sharp point G, and the other with a pair of pliers H fastened to it. The point and plyers are to thrust into, or take up and hold, any insect or object; and either of them may be turned upwards, as best suits the purpose. I is a ring of brass, with a female screw within it, mounted on an upright piece of the same metal; which turns round on a rivet, that it may be set at a due distance when the least magnifiers are employed. This ring receives the screws of all the magnifiers. K is a concave speculum of silver, polished as bright as possible; in the centre of which is placed a double convex lens, with a proper aperture to look through it. On the back of this speculum a male screw L is made to fit the brass ring I, to screw into it at pleasure. There are four of these concave specula of different depths, adapted to four glasses of different magnifying powers, to be used as the objects to be examined may require. The greatest magnifiers have the least apertures. M, is a round object-plate, one side of which is white and the other black: The intention of this is to render objects the more visible, by placing them, if black, on the white side, or, if white, on the black side. A steel spring N turns down on each side to make any object fast; and issuing from the object-plate is a hollow pipe to screw it on the needle's point G. O, is a small box of brass, with a glass on each side, contrived to confine any living object, in order to examine it: this also has a pipe to screw upon the end of the needle G. P, is a turned handle of wood, to screw into the instrument when it is made use of. Q, a pair of brass pliers to take up any object, or manage it with conveniency. R, is a soft hair-brush for cleaning the glasses, &c. S, is a small ivory box for tales, to be placed, when wanted, in the small brass-box O.

When you would view any object with this microscope, screw the speculum, with the magnifier you think proper to use, into the brass ring I. Place your object, either on the needle G in the pliers H, on the object-plate M, or in the hollow brass box O, as may be most convenient: then holding up your instrument by the handle P, look against the light through the magnifying lens; and by means of the nut D, together with the motion of the needle, by managing its lower end, the object may be turned about, raised, or depressed, brought nearer the glass, or removed farther from it, till you find the true focal distance, and the light be seen strongly reflected from the speculum upon the object, by which means it will be shown in a manner surprisingly distinct and clear; and for this purpose the light of the sky or of a candle will answer very well. Transparent objects may also be viewed by this microscope; only observing, that when such come under examination, it will not always be proper to throw on them the light reflected from the speculum; for the light transmitted through them, meeting the reflected light, may together produce too great a glare. A little practice, however, will show how to regulate both lights in a proper manner.

4. *Ellis's single and Aquatic Microscope.* Fig. 4. represents a very convenient and useful microscope, contrived by Mr John Ellis, author of An Essay upon Corallines, &c. To practical botanists, observers of animalcula, &c. it possesses many advantages above those just described. It is portable, simple in its construction, expeditious, and commodious in use. K, represents the box containing the whole apparatus: it is generally made of fish-skin; and on the top there is a female screw, for receiving the screw that is at the bottom of the pillar A: this is a pillar of brass, and is screwed on the top of the box. D, is a brass pin which fits into the pillar; on the top of this pin is a hollow socket to receive the arm which carries the magnifiers; the pin is to be moved up and down, in order to adjust the lenses to their focal or proper distance from the object. [N. B. In the representations of this microscope, the pin D is delineated as passing through a socket at one side of the pillar A; whereas it is usual at present to make it pass down a hole bored through the middle of the pillar.] E, the bar which carries the magnifying lens; it fits into the socket X, which is at the top of the pin or pillar D. This arm may be moved backwards and forwards in the socket X, and sideways by the pin D; so that the magnifier, which is screwed into the ring at the end E of this bar, may be easily made to traverse over any part of the object that lies on the stage or plate B. FF is a polished silver speculum, with a magnifying lens placed at the centre thereof, which is perforated for this purpose. The silver speculum screws into the arm E, as at F. G, another speculum, with its lens, which is of a different magnifying power from the former. H, the semicircle which supports the mirror I; the pin R, affixed to the semicircle H, passes thro' the hole which is towards the bottom of the pillar A. B, the stage, or the plane, on which the objects are to be placed; it fits into the small dove-tailed arm which is at the upper end of the pillar DA. C, a plane glass, with a small piece of black silk stuck on it; this glass is to lay in a groove made in the stage B. M, a hollow glass to be laid occasionally on the stage instead of the plane glass C. L, a pair of nippers. These are fixed to the stage by the pin at bottom; the steel wire of these nippers slides backwards and forwards in the socket, and this socket is moveable upwards and downwards by means of the joint, so that the position of the object may be varied at pleasure. The object may be fixed in the nippers, stuck on the point, or affixed, by a little gum-water, &c. to the

ivory

ivory cylinder N, which occaſionally ſcrews to the point of the nippers.

To *uſe* this microſcope: Take all the parts of the apparatus out of the box; then begin by ſcrewing the pillar A to the cover thereof; paſs the pin R of the ſemicircle which carries the mirror thro' the hole that is near the bottom of the pillar A; puſh the ſtage into the dove-tail at B, ſlide the pin into the pillar (ſee the N. B. above); then paſs the bar E through the ſocket which is at the top of the pin D, and ſcrew one of the magnifying lenſes into the ring at F. The microſcope is now ready for uſe; and though the enumeration of the articles may lead the reader to imagine the inſtrument to be of a complex nature, we can ſafely affirm that he will find it otherwiſe. The inſtrument has this peculiar advantage, that it is difficult to put any of the pieces in a place which is appropriated to another. Let the object be now placed either on the ſtage or in the nippers L, and in ſuch manner that it may be as nearly as poſſible over the centre of the ſtage: bring the ſpeculum F over the part you mean to obſerve; then throw as much light on the ſpeculum as you can, by means of the mirror I, and the double motion of which it is capable; the light received on the ſpeculum is reflected by it on the object. The diſtance of the lens F from the object is regulated by moving the pin D up and down, until a diſtinct view of it is obtained. The beſt rule is, to place the lens beyond its focal diſtance from the object, and then gradually to ſlide it down till the object appears ſharp and well defined. The adjuſtment of the lenſes to their focus, and the diſtribution of the light on the object, are what require the moſt attention: on the firſt the diſtinctneſs of the viſion depends; the pleaſure ariſing from a clear view of the parts under obſervation is due to the modification of the light. No preciſe rule can be given for attaining accurately theſe points; it is from practice alone that ready habits of obtaining theſe neceſſary properties can be acquired, and with the aſſiſtance of this no difficulty will be found.

5. A very ſimple and convenient microſcope for botanical and other purpoſes, though inferior in many reſpects to that of Mr Ellis, was contrived by the late ingenious Mr Benjamin Martin, and is repreſented at fig. 5. where AB repreſents a ſmall arm ſupporting two or more magnifiers, one fixed to the upper part as at B, the other to the lower part of the arm at C; theſe may be uſed ſeparately or combined together. The arm AB is ſupported by the ſquare pillar IK, the lower end of which fits into the ſocket E of the foot FG; the ſtage DL is made to ſlide up and down the ſquare pillar; H, a concave mirror for reflecting light on the object.—To *uſe* this microſcope, place the object on the ſtage, reflect the light on it from the concave mirror, and regulate it to the focus, by moving the ſtage nearer to or farther from the lens at B. The ivory ſliders paſs through the ſtage; other objects may be fixed in the nippers MN, and then brought under the eye-glaſſes; or they may be laid on one of the glaſſes which fit the ſtage. The apparatus to this inſtrument conſiſts of three ivory ſliders; a pair of nippers; a pair of forceps; a flat glaſs and a concave ditto, both fitted to the ſtage.

The two laſt microſcopes are frequently fitted up with a toothed rack and pinion, for the more ready adjuſtment of the glaſſes to their proper focus.

6. *Withering's portable Botanic Microſcope.* Fig. 6. repreſents a ſmall botanical microſcope contrived by Dr Withering, and deſcribed by him in his *Botanical Arrangements.* It conſiſts of three braſs plates, A, B, C, which are parallel to each other; the wires D and E are rivetted into the upper and lower plates, which are by this means united to each other; the middle plate or ſtage is moveable on the aforeſaid wires by two little ſockets which are fixed to it. The two upper plates each contain a magnifying lens, but of different powers; one of theſe confines and keeps in their places the fine point F, the forceps G, and the ſmall knife H.—To *uſe* this inſtrument, unſcrew the upper lens, and take out the point, the knife, and the forceps; then ſcrew the lens on again, place the object on the ſtage, and then move it up or down till you have gained a diſtinct view of the object, as one lens is made of a ſhorter focus than the other; and ſpare lenſes of a ſtill deeper focus may be had if required. This little microſcope is the moſt portable of any. Its principal merit is its ſimplicity.

7. *Botanical Lenſes or Magnifiers.* The haſte with which botaniſts, &c. have frequently occaſion to view objects, renders an extempore pocket-glaſs indiſpenſably neceſſary. The moſt convenient of any yet conſtructed, appears to be that contrived, in regard to the form of the mounting, by the late Mr Benjamin Martin; and is what he called a *Hand Megalaſcope*, becauſe it is well adapted for viewing all the larger ſort of ſmall objects univerſally, and by only three lenſes it has ſeven different magnifying powers.

Fig. 7. repreſents the caſe with the three frames and lenſes, which are uſually of 1, $1\frac{1}{2}$, and 2 inches focus; they all turn over each other, and ſhut into the caſe, and are turned out at pleaſure.

The three lenſes ſingly, afford three magnifying powers; and by combining two and two, we make three more: for *d* with *e* makes one, *d* with *f* another, and *e* with *f* a third; which, with the three ſingly, make ſix; and laſtly, all three combined together make another; ſo that upon the whole, there are ſeven powers of magnifying with theſe glaſſes only.

When the three lenſes are combined, it is better to turn them in, and look through them by the ſmall apertures in the ſides of the caſe. The eye in this caſe is excluded from extra light; the aberration of the ſuperfluous rays through the glaſſes is cut off; and the eye coincides more exactly with the common axes of the lenſes.

A very uſeful and eaſy kind of microſcope (deſcribed by Joblot, and which has been long in uſe), adapted chiefly for viewing, and confining at the ſame time, any living inſects, ſmall animals, &c. is ſhown at fig. 8. where A repreſents a glaſs tube, about $1\frac{1}{2}$ inches diameter, and 2 inches high. B, a caſe of braſs or wood, containing a ſliding tube, with two or three magnifying glaſſes that may be uſed either ſeparately or combined. In the inſide, at the bottom, is a piece of ivory, black and white on oppoſite ſides, that is occaſionally removed, and admits a point to be ſcrewed into the centre. The cap unſcrews at D, to admit the placing of the object; the proper diſtance of the glaſſes from

Plate CCXCVIII.

Fig. 8.

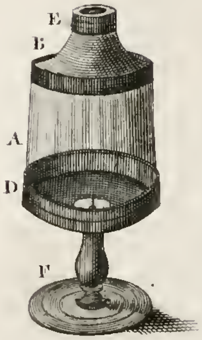


Fig. 9.

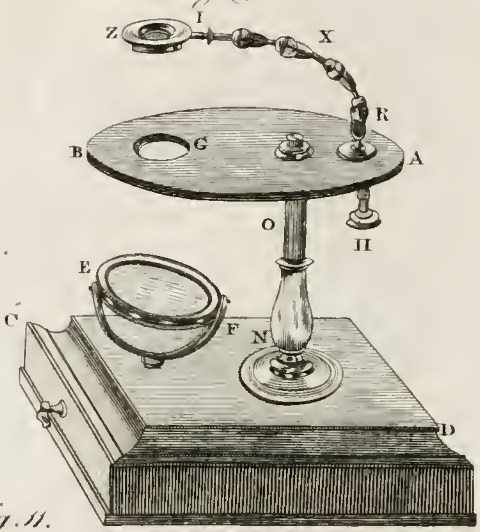


Fig. 10.

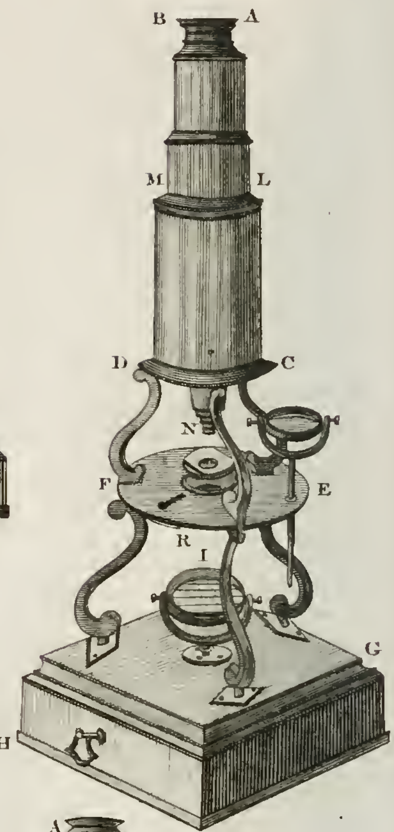


Fig. 11.

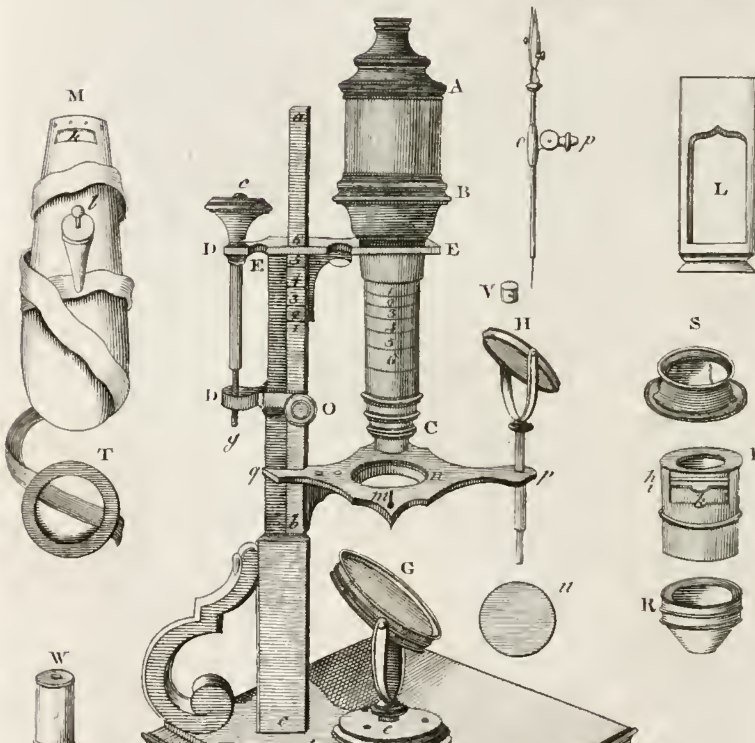
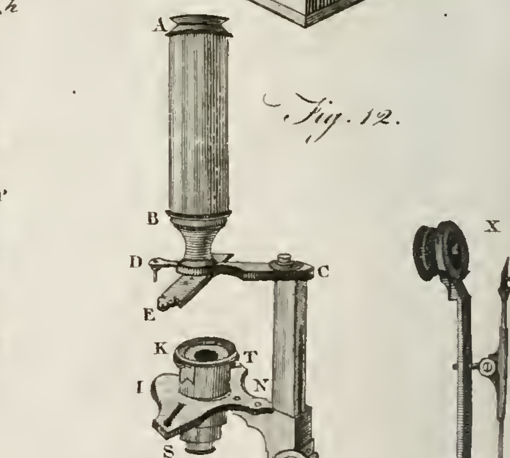


Fig. 12.



A. Bell Prin. Wal. Sculptor fecit

from the object is regulated by pulling up or down the brass tube E at top containing the eye-glasses.

This microscope is particularly useful for exhibiting the well-known curious *curculio imperialis*, vulgarly called the *diamond beetle*, to the greatest advantage; for which, as well as for other objects, a glass bottom, and a polished reflector at the top, are often applied, to condense the light upon the object. In this case, the stand and brass-bottom F, as shown in the figure, are taken away by unscrewing.

9. *Mr Lyonet's Single Anatomical Dissecting Microscope.* Fig. 9. represents a curious and extremely useful microscope, invented by that gentleman for the purpose of minute dissections, and microscopic preparations. This instrument must be truly useful to amateurs of the minutiæ of insects, &c. being the best adapted of any for the purposes of dissection. With this instrument Mr Lyonet made his very curious microscopical dissection of the *chenille de saule*, as related in his *Traitè Anatomique de la chenille qui ronge le bois de saule*, 4to.

AB is the anatomical table, which is supported by a pillar NO; this is screwed on the foot CD. The table AB is prevented from turning round by means of two steady pins. In this table or board there is a hole G, which is exactly over the centre of the mirror EF, that is to reflect the light on the object; the hole G is designed to receive a flat or concave glass, on which the objects for examination are to be placed.

RXZ is an arm formed of several balls and sockets, by which means it may be moved in every possible situation; it is fixed to the board by means of the screw H. The last arm IZ has a female screw, into which a magnifier may be screwed as at Z By means of the screw H, a small motion may be occasionally given to the arm IZ, for adjusting the lens with accuracy to its focal distance from the object.

Another chain of balls is sometimes used, carrying a lens to throw light upon the object; the mirror is likewise so mounted, as to be taken from its place at K, and fitted on a clamp, by which it may be fixed to any part of the table AB.

To use the Dissecting Table:—Let the operator sit with his left side near a light window; the instrument being placed on a firm table, the side DH towards the stomach, the observations should be made with the left eye. In dissecting, the two elbows are to be supported by the table on which the instrument rests, the hands resting against the board AB; and in order to give it greater stability (as a small shake, though imperceptible to the naked eye, is very visible in the microscope), the dissecting instruments are to be held one in each hand, between the thumb and two fore-fingers.

II. *Of* Double *Microscopes, commonly called* Compound *Microscopes.*

Double microscopes are so called, from being a combination of two or more lenses.

The particular and chief advantages which the compound microscopes have over the single, are, that the objects are represented under a larger field of view, and with a greater amplification of reflected light.

1. *Culpeper's Microscope.* The compound microscope, originally contrived by Mr Culpeper, is represented at fig. 10. It consists of a large external brass body A, B, C, D, supported upon three scrolls, which are fixed to the stage EF; the stage is supported by three larger scrolls, that are screwed to the mahogany pedestal GH. There is a drawer in the pedestal, which holds the apparatus. The concave mirror *I* is fitted to a socket in the centre of the pedestal. The lower part LMCD of the body forms an exterior tube, into which the upper part of the body ABLM slides, and may be moved up or down, so as to bring the magnifiers, which are screwed on at N, nearer to or farther from the object.

To *use* this microscope: Screw one of the buttons, which contains a magnifying lens, to the end N of the body; place the slider, with the objects, between the plates of the slider-holder. Then, to attain distinct vision, and a pleasing view of the object, adjust the body to the focus of the lens you are using, by moving the upper part gently up and down, and regulate the light by the concave mirror.

For opaque objects, two additional pieces must be used. The first is a cylindrical tube of brass (represented at L, fig. 11.), which fits on the cylindrical part at N of the body. The second piece is the concave speculum *b*; this is to be screwed to the lower end of the aforesaid tube: the upper edge of this tube should be made to coincide with the line which has the same number affixed to it as to the magnifier you are using; *ex. gr.* if you are making use of the magnifier marked 5, slide the tube to the circular line on the tube N that is marked also with N°5. The slider-holder should be removed when you are going to view opaque objects, and a plane glass should be placed on the stage in its stead to receive the object; or it may be placed in the nippers, the pin of which fits into the hole in the stage.

The apparatus belonging to this microscope consists of the following particulars; *viz.* Five magnifiers, each fitted in a brass button; one of these is seen at N, fig. 10. Six ivory sliders, five of them with objects. A brass tube, to hold the concave speculum. The concave speculum in a brass box. A fish pan. A set of glass tubes. A flat glass fitted to the stage. A concave glass fitted to the stage. A pair of forceps. A steel wire, with a pair of nippers at one end and a point at the other. A small ivory cylinder, to fit on the pointed end of the aforesaid nippers. A convex lens, moveable in a brass semicircle; this is affixed to a long brass pin, which fits into a hole on the stage.

The construction of the foregoing microscope is very simple, and it is easy in use; but the advantages of the stage and mirror are too much confined for an extensive application and management of all kinds of objects. Its greatest recommendation is its cheapness; and to those who are desirous of having a compound microscope at a low price, it may be acceptable.

2. *Cuff's Microscope.* The improved microscope next in order is that of Mr Cuff. Besides remedying the disadvantages above mentioned, it contains the addition of an adjusting screw, which is a considerable improvement, and highly necessary to the examination of objects under the best defined appearance from the glasses. It is represented at fig. 11. with the apparatus that usually accompanies it. A, B, C, shows the body of this microscope; which contains an eye-glass at A, a broad lens at B, and

Microscope a magnifier which is screwed on at C. The body is supported by the arm D E, from which it may be removed at pleasure. The arm D E is fixed on the sliding-bar F, and may be raised or depressed to any height within its limits. The main pillar *a b* is fixed in the box *b e;* and by means of the brass foot *d* is screwed to the mahogany pedestal X Y, in which is a drawer containing all the apparatus. O, is a milled-headed screw, to tighten the bar F when the adjusting screw *c g* is used. *p q* Is the stage, or plate, which carries the objects; it has a hole at the centre *n*. G a concave mirror, that may be turned in any direction, to reflect the light of a candle, or the sky, upon the object.

To *use* this microscope: Screw the magnifier you intend to use to the end C of the body, place the slider-holder P in the hole *n*, and the slider with the object between the plates of the slider-holder; set the upper edge of the bar D E to coincide with the divisions which correspond to the magnifier you have in use, and pinch it by the milled nut; now reflect a proper quantity of light upon the object, by means of the concave mirror G, and regulate the body exactly to the eye and the focus of the glasses by the adjusting screw *c g*.

To view *opaque* objects, take away the slider-holder P, and place the object on a flat glass under the centre of the body, or on one end of the jointed nippers *o p*. Then screw the silver concave speculum *h* to the end of the cylinder L, and slide this cylinder on the lower part of the body, so that the upper edge thereof may coincide with the line which has the same mark with the magnifier that is then used; reflect the light from the concave mirror G to the silver speculum, from which it will again be reflected on the object. The glasses are to be adjusted to their focal distance as before directed.

The *apparatus* consists of a convex lens H, to collect the rays of light from the sun or a candle, and condense them on the object. L a cylindrical tube, open at each side, with a concave speculum screwed to the lower end *h*. P the slider-holder: this consists of a cylindrical tube, in which an inner tube is forced upwards by a spiral spring; it is used to receive an ivory slider K, which is to be slid between the plates *h* and *i*. The cylinder P fits the hole *n* in the stage; and the hollow part at *k* is designed to receive a glass tube. R is a brass cone, to be put under the bottom of the cylinder P, to intercept occasionally some of the rays of light. S a box containing a concave and a flat glass, between which a small living insect may be confined: it is to be placed over the hole *n*. T a flat glass, to lay any occasional object upon; there is also a concave one for fluids. O is a long steel wire, with a small pair of pliers at one end, and a point at the other, designed to stick or hold objects; it slips backwards and forwards in the short tube *o;* the pin *p* fits into the hole of the stage. W a little round ivory box, to hold a supply of talc and rings for the sliders. V a small ivory cylinder, that fits on the pointed end of the steel wire: it is designed for opaque objects. Light-coloured ones are to be stuck upon the dark side, and *vice versa*. M a fish-pan, whereon to fasten a small fish, to view the circulation of the blood: the tail is to be spread across the oblong hole *k* at the small end, and tied fast, by means of a riband fixed thereto; the knob *l* is to be shoved through the slit made in the stage, that the tail may be brought under the magnifier.

3. This microscope has received several material improvements from Mr Martin, Mr Adams, &c. By an alteration, or rather an enlargement, of the body of the tube which contains the eye-glasses, and also of the eye-glasses themselves, the field of view is made much larger, the mirror below for reflecting light is made to move upon the same bar with the stage; by which means the distance of it from the stage may be very easily and suitably varied. A condensing glass is applied under the stage in the slider-holder, in order to modify and increase the light that is reflected by the mirrors below from the light of a candle or lamp. It is furnished also with two mirrors in one frame, one concave and the other plane, of glass silvered; and by simply unscrewing the body, the instrument, when desired, may be converted into a single microscope. Fig. 12. is a representation of the instrument thus improved; and the following is the description of it, as given by Mr Adams in his Essays.

A B represents the body of the microscope, containing a double eye-glass and a body-glass: it is here shown as screwed to the arm C D, from whence it may be occasionally removed, either for the convenience of packing, or when the instrument is to be used as a single microscope.

The eye glasses and the body glasses are contained in a tube which fits into the exterior tube A B; by pulling out a little this tube when the microscope is in use, the magnifying power of each lens is increased.

The body A B of the microscope is supported by the arm C D; this arm is fixed to the main pillar C F, which is screwed firmly to the mahogany pedestal G H; there is a drawer to this pedestal, which holds the apparatus.

N I S, The plate or stage which carries the slider-holder K L: this stage is moved up or down the pillar CF, by turning the milled nut M; this nut is fixed to a pinion, that works in a toothed rack cut on one side of the pillar. By means of this pinion, the stage may be gradually raised or depressed, and the object adjusted to the focus of the different lenses.

K L is a slider-holder, which fits into a hole that is in the middle of the stage N I S; it is used to confine and guide either the motion of the sliders which contain the objects, or the glass tubes that are designed to confine small fishes for viewing the circulation of the blood. The sliders are to be passed between the two upper plates, the tubes through the bent plates.

L is a brass tube, to the upper part of which is fixed the condensing lens before spoken of; it fits into the under part of the slider-holder K L, and may be set at different distances from the object, according to its distance from the mirror or the candle.

O is the frame which holds the two reflecting mirrors, one of which is plane, the other concave. These mirrors may be moved in various directions, in order to reflect the light properly, by means of the pivots on which they move, in the semicircle Q S R, and the motion of the semicircle itself on the pin S: the concave mirror generally answers best in the day-time; the plane mirror combines better with the condensing

 lens,

Microscope lens, and a lamp or candle. At D there is a socket for receiving the pin of the arm Q (fig. 31.), to which the concave speculum, for reflecting light on opaque objects, is fixed. At S is a hole and slit for receiving either the nippers L (fig. 31. Pl. ccci.) or the fish-pan I; when these are used, the slider-holder must be removed. T, a hole to receive the pin of the convex lens M, fig. 31.

To *use* this microscope: Take it out of the box. Screw the body into the round end of the upper part of the arm C D. Place the brass sliders, which contain the magnifiers, into the dove-tailed slit which is on the under side of the aforesaid arm, as seen at E, and slide it forwards until the magnifier you mean to use is under the centre of the body: opposite to each magnifier in this slit there is a notch, and in the dove-tailed part of the arm C D there is a spring, which falls into the above-mentioned notch, and thus makes each magnifier coincide with the centre of the body. Pass the ivory slider you intend to use between the upper plates of the slider-holder KL, and then reflect as strong a light as you can on the object by means of one of the mirrors; after this, adjust the object to the focus of the magnifier and your eye, by turning the milled screw M, the motion of which raises and depresses the stage N I S. The degree of light necessary for each object, and the accuracy required in the adjustment of the lenses to their proper focal distance from the object will be easily attained by a little practice.

When *opaque* objects are to be examined, remove the slider-holder, and place the object on a flat glass, or fix it to the nippers L, the pin of these fit into the hole on the stage; screw the concave speculum R into the arm Q (fig. 31.), and then pass the pin of this arm through the socket D, fig. 12. the light is now to be reflected from the concave mirror to the silver speculum, and from this down on the object. No exact rule can be given for reflecting the light on the object; we must therefore refer the reader to the mother of all aptness, practice. The speculum must be moved lower or higher, to suit the focus of the different magnifiers and the nature of the object.

The foregoing directions apply equally to the using of this instrument as a *single microscope;* with this difference only, that the body AB is then removed, and the eye is applied to the upper surface of the arm CD, exactly over the magnifiers.

This microscope is sometimes made with the following *alterations*, which are supposed to make it still more convenient and useful. The arm CD that carries the body and magnifiers is made both to turn on a pin, and to slide backwards and forwards in a socket at C; so that, instead of moving the objects below on the stage, and disturbing them, the magnifiers are more conveniently brought over any part of the objects as desired. The condensing glass is made larger, and slides upon the square bar CF quite distinct from the stage, like the mirrors below; and it is thereby made useful for any other objects that may be applied on glasses fitted to the stage, as well as those put into the slider-holder K. It is thereby not confined to this stage alone, as in the preceding. When the body AB is taken away, the arm CD may be slipt away from its bar, with the magnifiers, and the forceps, wire, and joint, applied to it; and it thereby serves the purpose of a small hand single or opaque microscope, for any object occasionally applied to this wire. The magnifiers in the slider E are mounted in a wheel case, which perhaps prevents its being in the way so much as the long slider E before described.—This contrivance is represented at X, fig. 12.

4. *Martin's New Universal Compound Microscope.*—This instrument was originally constructed by the late Mr B. Martin, and intended to comprise all the uses and advantages of the single, compound, opaque, and aquatic microscopes. The following is a description of it as now made, with a few alterations, chiefly suggested (we are told) by Mr Jones of Holborn.

Fig. 13. is a representation of the instrument placed up for use. A, B, C, D, is the body of the microscope: which consists of four parts, viz. AB the eye-piece, or that containing the eye-glasses, and is screwed into C, which is a moveable or sliding tube on the top; this inner tube contains the body-glass screwed into its lower part. D is the exterior tube or case, in which the other slides up and down in an easy and steady manner. This motion of the tube C is useful to increase or decrease the magnifying power of the body-glass when thought necessary, as before mentioned. E is a pipe or snout screwed on to the body of the microscope D, and at its lower part, over the several magnifying lenses hereafter described. FGHI is the square stem of the microscope, upon which the stage R moves in an horizontal position, upwards or downward, by means of the fine rackwork of teeth and pinion. KL is a strong solid joint and pillar, by which the position of the instrument is readily altered from a vertical one to an oblique or to a perfectly horizontal one, as may be required: it is thus well adapted to the ease of the observer either sitting or standing; and as it is very often convenient to view objects by direct unreflected light, when the square stem FI is placed in an horizontal position for this purpose, the mirror T is then to be taken off in order to prevent the obstruction of the rays. M is a circular piece of brass, serving as a base to the pillar. NOP, the tripod or foot by which the whole body of the microscope is steadily supported; it folds up when packed into the case. W is a brass frame, that contains the condensing lens, and acts in conjunction with the large concave and plane mirrors below at T; the reflected rays from which, either of the common light or of that of a candle or lamp, it agreeably modifies, and makes steady in the field of view. Plate CCXCIX.

The particulars of the apparatus to this microscope are as follow: Q is a circular brass box, containing six magnifiers or object lenses, numbered 1, 2, 3, 4, 5, 6; the digits of which appear severally through a small round hole in the upper plate of it. To the upper side is fixed a small circle of brass, by which it is connected with, and screwed into, the round end of the arm *abcd;* which is a long piece of brass, and moves through either by teeth or pinion, or not, as may be desired, in *ef;* which is a socket on the upper part of the pillar, and admits, with a motion both easy and steady, the brass arm. R is a fixed stage, upon which the objects to be viewed are to be placed: it is firmly fastened to the square pillar, which is moved by the rackwork. In the middle is a large circular hole, for

 receiving

receiving concave glasses, with fluids, &c. it has also a sliding spring-frame to fasten down slips of glass or other things: at *a b c* are three small sockets or holes, intended to receive several parts of the apparatus. S is the refractor, or illuminating lens, for converging the sun's rays upon opaque objects laid upon the stage R. To this purpose it moves on a semicircle upon a long shank *g*, in a spring socket *h*, in the arm *i*; this arm moving every way by a stout pin *k* in the socket *a* of the stage. In this manner it is easily adjusted to any position of the sun, candle, &c.—T, the reflecting-glass frame, containing a concave and plane speculum, which is moved upon the square pillar by the hand. The use of it is to illuminate all transparent objects that are applied to the stage above.

Fig. 14. n° 1. is an auxiliary moveable stage: which by means of a pin *b* is placed in the hole *a* of the stage R, and can be moved in an horizontal direction over the whole field of the stage. In this stage, there are three circular holes with shouldered bottoms; a large one in the middle, and on each side a small one, for the reception of the three following necessary articles: n° 2. a watch glass to be placed in the large hole, to hold fluids containing animalcules, &c.; a circular piece of ivory, n° 3 one side of which is black, the other white, to support opaque objects of different contrasted colours; and circular plane and concave glasses, n° 4. for extemporaneous transparent objects.—The same use is made of the other small hole as of the large one, only in a lesser degree, to receive small concave glasses, plates, &c.

N° 5.* is the silvered speculum, called a *Liberkhun*, which makes the single opaque microscope, by being screwed to the slider *abcd* (fig. 13.) in room of the box of lenses Q, and the body AE above it. The chief use of this is to view very small objects strongly illuminated near the compounded focus of the mirror T (fig. 13.) N° 6. is the forceps or pliers, for holding such kind of objects, and by which they can be applied very readily to the focus of the lens in the liberkhun. They have a motion all ways by means of the spring socket *a*, the joint *b*, and the shank *c*: they are placed in the socket *c* of the fixed stage R (fig. 13.) N° 7. is a small piece of ivory, to be placed upon the pointed end of the pliers: it is black upon one side, and white upon the other, to receive opaque objects.

* Or that adjoining to n° 8. (the n° having been omitted by the engraver).

N° 8. is a liberkhun of a larger size than that first mentioned, with a hole in its centre: this is screwed into n° 9. the hole *a* of a brass ring, fastened to a long wire *b*; which moves up and down in the spring socket *b* of the stage R, in which it also moves sideways; and thus, with the body AE above, forms an *aquatic compound microscope* for showing all sorts of objects in water and other fluids placed under it in the watch-glass n° 2. on the stage.

N° 11. is a cone, with a proper aperture *a* to exclude superfluous light, that would disturb a critical observation of a curious object; it is placed on the under side of the fixed stage R.

N° 12. is what is usually called a bug-box, consisting of a concave glass with a plane one screwed over it; by means of which a bug, louse, flea, &c. may be secured and viewed alive. It is to be placed on either of the stages R (fig. 13.), or n° 1 (fig. 14.)

N° 13. is the fish-pan. In the long concave body *ab*, a fish may be so confined by the ribband *c*, that the transparent tail may be in part over the slit or hole at *a*. In this state, it is placed on the stage R, with the pin *d* in the hole *c* of the stage, and moves freely and horizontally for viewing the circulation of the blood, &c.

N° 14. is the slider-holder that is placed on the stage R: it receives the sliders and tubes when filled with transparent objects, to be viewed either by the compound or single microscope.

N° 15. represents the ivory slider, to hold the objects between the talcs as usual.

N° 16. is a useful auxiliary slider framed in brass. In this slider small concave glasses are cemented; and a slip of plane glass slides over them; by which any small living object, as mites, &c. may be confined without injury, and deliberately viewed.

N° 17. represents a set of glass tubes, three in number, one within another; they are useful for small tadpoles, water-newts, eels, &c. when the circulation of the blood is to be viewed. There is a small hole at one end of each tube, that serves to admit the air; for when they are filled with water, the other end is stopped with a cork.

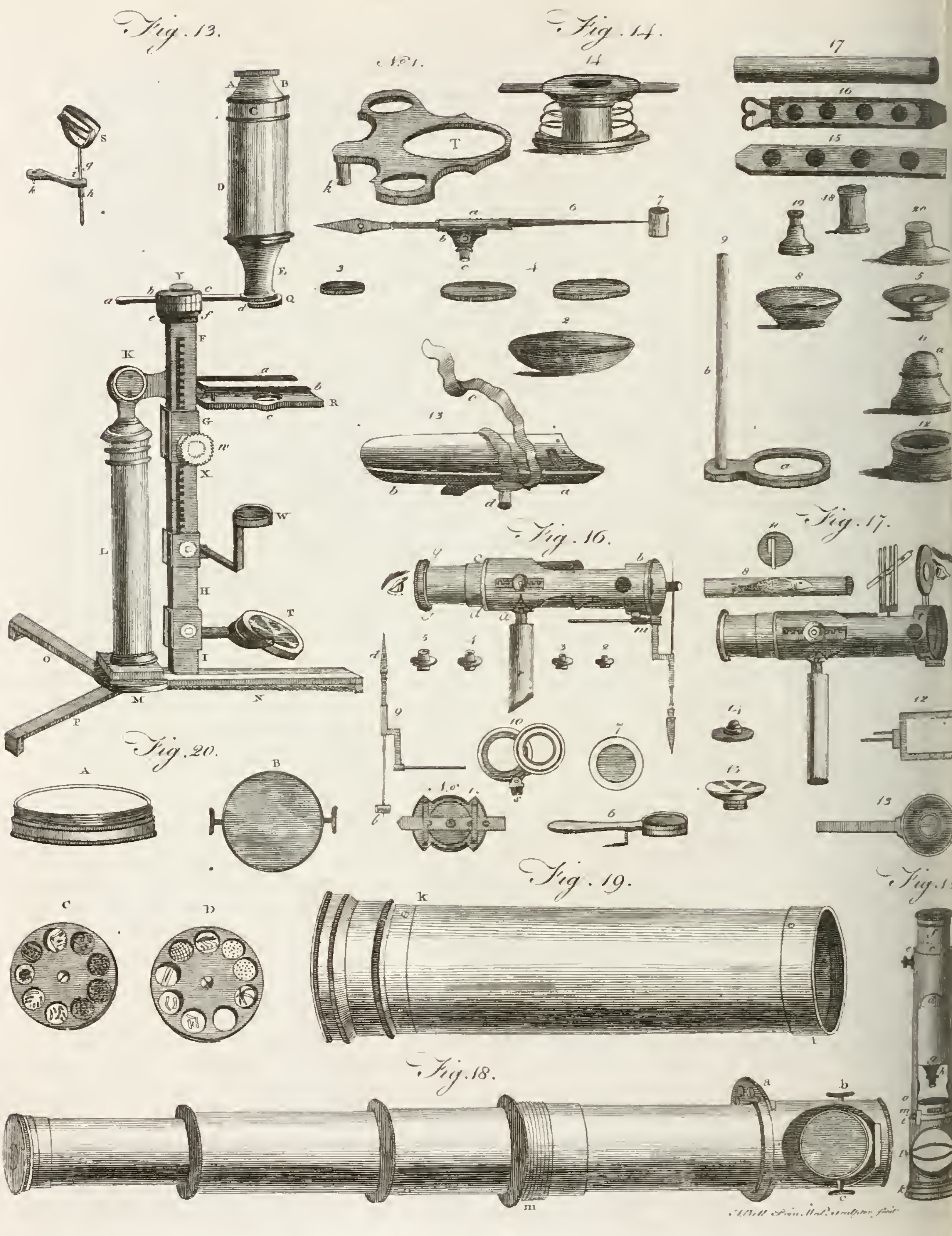
N° 18. is a small ivory box, containing spare talcs and wires, to supply the sliders with occasionally.

N° 19. a brass cell or button, containing a very small lens, properly set between two small plates of brass, that it may be brought very near to the object when viewed therewith as a single microscope. This magnifier is screwed into the same hole as the wheel of six magnifiers Q are (fig. 13).

N° 20. is a lens, adapted to view and examine objects, by magnifying them sufficiently, so as to be able to apply them to the microscope for inspection: on this account it is called the *explorator*.

The preceding are the chief articles of the apparatus; which, on account of their being somewhat different from what is applied to other microscopes, we have been thus particular in describing. In using the microscope, and while viewing objects by either the single or compound instrument, the focal distances of the magnifiers are made perfectly exact by turning of the pinion at the nut *w*, in one way or the other, very gently in the teeth of the rack-work at X (fig. 13).

It is necessary that the centres of the object lenses or magnifiers, the stage, and the mirrors at bottom, should all be in a right line in the axis of the microscope, when opaque objects are to be viewed, that are placed upon the ivory piece n° 7, or the forceps n° 6. and all other such sort of objects which are placed in the centre of the stage R, or slider-holder n° 14: But when aquatic or living objects, which require a great space to move in, are to be viewed, then the horizontal motion at *ef* (fig. 13.) is made use of, and the view may be extended laterally over the whole of the diameter of the object or field of view; and by putting the arm *abcd* forward or backward in its socket *ef*, the view is extended in the contrary direction equally well; and in this manner the whole of



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of the objects may be viewed without the leaft difturbance.

As the brafs arm *abcd* may be brought to the height of three or four inches above the ftage R; fo, by means of the rack-work motion of the ftage, a lens of a greater focal diftance than the greateft in the wheel Q may be occafionally applied in place of the wheel, and thereby the larger kind of objects be viewed; the inftrument becoming, in this cafe, what is called a *megalafcope*.

In viewing moving living objects, or even fixed ones, when nice motions are requifite, a rack-work and pinion is often applied to the arm *abcd:* the arm is cut out with teeth; and the pinion, as fhown at Y, is applied to work it. This acts but in one direction; and, in order to produce an equally neceffary motion perpendicular to this, rack-work and pinion is applied tangent-wife to the ftage, which is then jointed.

What has been related above refpects the conftruction of thofe denominated *parlour* microfcopes, in contradiftinction to thofe which are portable: their dimenfions, however, have been confiderably reduced by opticians, in order to render them fit for the pocket; and as they are for the moft part conftructed on nearly the fame principles as thofe which have been already defcribed, what has been faid will fufficiently inftruct our readers in ufing any pocket microfcope whatever. Only it may be obferved, that in thofe reduced inftruments, both the field of view and the magnifying power are proportionably diminifhed.

We fhall conclude the account of this fort of microfcope with defcriptions of a very portable pocket apparatus of microfcopic inftruments, and of a new microfcopic pocket-telefcope, both invented by the late Mr B. Martin, and fince made by moft inftrument-makers in London.

The former is reprefented at fig. 15. It confifts of two parts, viz. the body *ab*, and the pedeftal *ik*, which is joined by a fcrew at the part between *b* and *i*. It confifts of three cylindric tubes, viz. (1.) the exterior tube, or cafe *ab;* (2.) a middle tube *cb;* and (3.) the interior tube *fg*.—The middle tube *cd* is the adjufter; and is connected with the outer tube by the rack-work of teeth and pinion, as fhown at *e:* by which means it is moved up and down at pleafure through the fmalleft fpace, and carries with it the internal tube *fg*. The interior tube *fg* receives on its lower part at *b* the feveral capfules or boxes 2, 3, 4, 5, (fig. 16.) which contain the object lenfes or magnifiers.

The method of *ufing* this compound microfcope in the perpendicular pofition, is as follows. The ftage n° 1. is put within the exterior tube at *b*. Under the fprings are applied the four ivory fliders, which contain a variety of tranfparent objects; then move the interior tube *fg* up and down with the hand, till you difcern the object in the flider, and there let it reft. After this, turn the pinion at *e* very tenderly one way or the other, till you obtain a perfect view of the tranfparent objects properly illuminated, from a mirror contained in the pedeftal or ftand *ik*, fufpended upon, and moveable about, the points of two fcrews *(ll)*. N° 6. (fig. 16.) reprefents a moveable ftage, which is placed in the fpring focket *m*. It contains a concave glafs, for the reception of animalcules in fluids; and has the advantage of bringing any part into view by moving the handle at *n*. If living and moving objects are required to be fhown, they muft be confined in the concave, by putting a glafs cover, n° 7. upon the ftage; and then a fmall fpider, a loufe, flea, bug, &c. may be feen, and the motion or circulation of the blood, &c. obferved with furprifing diftinctnefs.

To view the circulation of the blood in the moft eminent degree, it muft be done by placing fmall frogs, tadpoles, water-newts, fifhes, &c. in a tube as reprefented n° 8. (fig. 17.); which tube is placed in the holes *o* in the oppofite fides of the cafe *al*, fig. 15. in the lower part.—N° 9. (fig. 16.) is a pair of pincers or pliers *a*, for holding any object; the other end of the fteel wire is pointed to receive a piece of ivory *b*, with one end black, and the other white, on which you flick objects of different hue: this alfo, when ufed, is placed in the fpring focket *m*.

To ufe this inftrument as a compound opaque, you fcrew off the body part *ab*, and fcrew to it the handle *r* (fig. 16.); by this means you may hold the microfcope in a horizontal pofition, as fhown in the figure. The filver difh or fpeculum (which is contained in the bottom or bafe *k*, fig. 15), is then fcrewed on at *b*. N° 9. is placed in the fpring-focket *m*, and adjufted backward and forward in *m*, till the reflected light from the fpeculum falls in a proper manner on the opaque object. Either of the 4 magnifiers, 2, 3, 4, 5, may be ufed, and brought to a proper focus, as before defcribed, by the tooth and pinion *e* (fig. 15.) If you take off the opaque apparatus, and apply the ftage n° 1. (fig. 16.) with an ivory flider, and at the end *b* fcrew in either of the two lenfes, n° 10. (which are diftinguifhed by the name of illuminators), the microfcope being held up to the light (and properly adjufted), the whole field of view will be ftrongly illuminated, and prefent a moft pleafing appearance of any tranfparent object. Thefe two convex lenfes are of different focufes, and are to be ufed fingly or together; n° 2. being the greateft magnifier, will require the object to be ftrongly illuminated, and of courfe both the lenfes muft be ufed together. By candle-light, this method of viewing tranfparent objects will prove very entertaining; by fcrewing the handle *r* into the part *s* of n° 10. it becomes a delightful hand megalafcope for viewing flowers, foffils, fhells, &c.; and each lens, as before mentioned, having a different focus, produces two magnifying powers ufed fingly, and when combined a third.

The manner of ufing this inftrument as a fingle microfcope (like Wilfon's) is reprefented in fig. 17. where the button or magnifier at each is to be fcrewed off, and the circular piece n° 11. is fcrewed in its place. This piece has a fpring focket made to receive the flider holder n° 12. N° 13. is a circular piece of brafs, with a long fhank and fpring, and is introduced through the outfide tube *ab* at *t*. N° 2, 3, 4, 5, are fcrewed occafionally in the centre of this piece, and ufed as fingle lenfes with ivory fliders, &c. N° 14. contains a lens of a great magnifying power, for viewing very minute objects: to render this inftrument the moft complete fingle opaque microfcope, you have only to fcrew into n° 13. the filver fpeculum n° 15, which has a small lens set in its centre. The slider-holder n° 12 is taken out of n° 11, and the pincers or nippers *d b*, being detached from the other part of n° 9. are passed through the long spring socket n° 11. and ready to receive any opaque body in the pincers or on the black and white piece of ivory. To the large screw of n° 13. are applied the two lenses n° 10. which make it the completest megalascope that can be desired.

The handle *r* contains the four ivory sliders with objects.

The shagreeen case which contains this universal microscope and its apparatus, is six inches long, three inches wide, two inches deep, and weighs together 16 ounces. "Thus (says Mr Martin) so small, so light, so portable, and yet so universally complete, is this pocket microscopic apparatus, that you find nothing material in the large three-pillared microscope, the opaque microscope, Wilson's single microscope, and the aquatic microscope, all together, which you have not in this; beside some very considerable advantages in regard to the field of view, &c. which they have not (A)."

This inventive artist having contrived a construction of the compound microscope so small as to admit of being packed in a common walking cane, thought next of introducing the same instrument into the inside of what he called his *Pocket Three-brass drawer Achromatic Telescope*. The same eye-glasses that serve the purpose of a telescope, answer as the compound magnifier, for viewing transparent and opaque objects in a microscope.

Fig. 18, 19, 20. represent the telescope separated by unscrewing it at *m*, in order that the whole of the necessary parts in use may be exhibited. Fig. 19. represents the exterior tube, which is of mahogany, and its rims of brass. It is detached from the rest of the telescope, as not making any part of the microscope. The brass cover *k l*, that shuts up the object-glass of the telescope, is also the box which contains the two-wheel object frames, and a small plain reflecting mirror.

In fig. 20. A is the cover taken off, by unscrewing the top part: The mirror B is taken out; and also, by unscrewing the bottom part, the two circular wheels, with the objects shown in C and D.

Fig. 18. is a representation of the three internal brass sliding tubes of the telescope, which form the microscopic part. The tubes are to be drawn out as shown in this figure; then, at the lower end of the large tube in the inside, is to be pulled out a short tube *bc*, that serves as a kind of stage to hold the wheels with objects, and support the reflecting mirror. This tube is to be partly drawn out, and turned so that the circular hole that is pierced in it may coincide with a similar hole that is cut in the exterior tube. This tube is represented as drawn out in the figure; and the mirror B placed therein, and the wheel with transparent objects. C (fig. 20.) represents the wheel with transparent objects, and D the wheel with opaque objects. They are both made of ivory; and turn round upon a centre brass pin slit upon the top, which sits upon the edge of the tube; which tube is then to be pushed up into the telescope tube, so that its lower end may rest upon the upper edge of the wheel according to its view at *a* fig. 18.

In viewing the objects, the second brass tube of the telescope must be pushed down, till its milled edge at top falls upon that of the exterior tube; taking care that the circular hole is duly placed to the exterior one. These circular holes are not seen in fig. 18. being supposed in the opposite side, where the wheel is fixed. The adjustment for the focus is now only necessary; which is obtained by pushing downwards or upwards the proper tube, till the object appear quite distinct. In viewing transparent objects, the instrument may be used in two positions; one vertical, when the light is to be reflected upon the object by the mirror; the other, by looking up directly against the light of a candle, common light, &c.; in which case the mirror must be taken away. In viewing opaque objects, the mirror is not used: but as much common light as possible must be admitted through the circular holes in the sides of the tubes.

There is a spare hole in the transparent wheel, and also one in the opaque, to receive any occasional object that is to be viewed. Any sort of object whatsoever may be viewed, by only pushing up the microscope tube into its exterior, and bringing the first eye-tube to its focal distance from the object.

The brass tubes are so contrived, that they stop when drawn out to the full length: so that by applying one hand to the outside tube, and the other to the end of the smallest tube, the telescope at one pull may be drawn out; then any of the tubes (that next to the eye is best) may be pushed in gradually, till the most distinct view of the object be obtained.

The tubes all slide through short brass spring tubes, any of which may be unscrewed from the ends of the sliding tubes by means of the milled edges which project above the tubes, taken from each other, and the springs set clear if required.

III. *Of Solar Microscopes.*

Plate CCC.

This instrument, in its principle, is composed of a tube, a looking-glass or mirror, a convex lens, and Wilson's single microscope before described. The sun's rays being reflected through the tube by means of the mirror upon the object, the image or picture of the object is thrown distinctly and beautifully upon a screen of white paper or a white linen sheet, placed at

(A) Notwithstanding the properties that have been ascribed to the above instrument, and the praises bestowed upon it by some, which induced us to admit so minute a description; we must apprise our readers, that it has been omitted in Mr Adams's enumeration: and upon inquiry we learn, that it has fallen into neglect among the most judicious opticians, being found too imperfect to serve the purposes of science, and too complicated for the use of persons who seek only entertainment.

Microſcope at a proper diſtance to receive the ſame; and may be magnified to a ſize not to be conceived by thoſe who have not ſeen it: for the farther the ſcreen is removed, the larger will the object appear; inſomuch, that a louſe may thus be magnified to the length of five or ſix feet, or even a great deal more; though it is more diſtinct when not enlarged to above half that ſize.

The different forms in which the Solar Microſcope is conſtructed, are as follow.

I. The old conſtruction is repreſented in fig. 21. A is a ſquare wodden frame, through which paſs two long ſcrews aſſiſted by a couple of nuts 1, 1. By theſe it is faſtened firmly to a window ſhutter, wherein a hole is made for its reception; the two nuts being let into the ſhutter, and made faſt thereto. A circular hole is made in the middle of this frame to receive the piece of wood B, of a circular figure; whoſe edge, that projects a little beyond the frame, compoſes a ſhallow groove 2, wherein runs a catgut 3; which, by twiſting round, and then croſſing over a braſs pulley 4, (the handle whereof 5, paſſes through the frame), affords an eaſy motion for turning round the circular piece of wood B, with all the parts affixed to it. C is a braſs tube, which, ſcrewing into the middle of the circular piece of wood, becomes a caſe for the uncovered braſs tube D to be drawn backwards or forwards in. E is a ſmaller tube, of about one inch in length, cemented to the end of the larger tube D. F is another braſs tube, made to ſlide over the above deſcribed tube E; and to the end of this the microſcope muſt be ſcrewed, when we come to uſe it. 5. a convex lens, whoſe focus is about 12 inches, deſigned to collect the ſun's rays, and throw them more ſtrongly upon the object. G is a looking-glaſs of an oblong figure, ſet in a wooden frame, faſtened by hinges in the circular piece of wood B, and turning about therewith by means of the abovementioned cat-gut. H is a jointed wire, partly braſs and partly iron; the braſs part whereof 6, which is flat, being faſtened to the mirror, and the iron part 7, which is round, paſſing through the wooden frame, enable the obſerver, by putting it backwards or forwards, to elevate or depreſs the mirror according to the ſun's altitude. There is a braſs ring at the end of the jointed wire 8, whereby to manage it with the greater eaſe. The extremities of the cat-gut are faſtened to a braſs pin, by turning of which it may be braced up, if at any time it becomes too ſlack.

When this microſcope is employed, the room muſt be rendered as dark as poſſible; for on the darkneſs of the room, and the brightneſs of the ſunſhine, depend the ſharpneſs and perfection of your image. Then putting the looking-glaſs G through the hole in your window-ſhutter, faſten the ſquare frame A to the ſhutter by its two ſcrews and nuts 1, 1. This done, adjuſt your looking-glaſs to the elevation and ſituation of the ſun, by means of the jointed wire H, together with the cat-gut and pulley, 3, 4. For the firſt of theſe raiſing or lowering the glaſs, and the other inclining it to either ſide, there reſults a twofold motion, which may eaſily be ſo managed as to bring the glaſs to a right poſition, that is, to make it reflect the ſun's rays directly through the lens 5, upon the paper ſcreen, and form thereon a ſpot of light exactly round. But though the obtaining a perfect circular ſpot of light upon the ſcreen before you apply the microſcope, is a certain proof that your mirror is adjuſted right, that proof muſt not always be expected: for the ſun is ſo low in winter, that if it ſhine in a direct line againſt the window, it cannot then afford a ſpot of light exactly round; but if it be on either ſide, a round ſpot may be obtained, even in December. As ſoon as this appears, ſcrew the tube C into the braſs collar provided for it in the middle of your wood-work, taking care not to alter your looking-glaſs: then ſcrewing the magnifier you chooſe to employ to the end of your microſcope in the uſual manner, take away the lens at the other end thereof, and place a ſlider, containing the objects to be examined, between the thin braſs plates, as in the other ways of uſing the microſcope.

Things being thus prepared, ſcrew the body of the microſcope over the ſmall end E of the braſs tube F; which ſlip over the ſmall end E of the tube D, and pull out the ſaid tube D leſs or more as your object is capable of enduring the ſun's heat. Dead objects may be brought within about an inch of the focus of the convex lens 5; but the diſtance muſt be ſhortened for living creatures, or they will ſoon be killed.

If the light fall not exactly right, you may eaſily, by a gentle motion of the jointed wire and pulley, direct it through the axis of the microſcopic lens. The ſhort tube F, to which the microſcope is ſcrewed, renders it eaſy, by ſliding it backwards or forwards on the other tube E, to bring the objects to their focal diſtance; which will be known by the ſharpneſs and clearneſs of their appearance: they may alſo be turned round by the ſame means without being in the leaſt diſordered.

The magnifiers moſt uſeful in the ſolar microſcope are in general, the fourth, fifth, or ſixth. The ſcreen on which the repreſentations of the objects are thrown, is uſually compoſed of a ſheet of the largeſt elephant paper, ſtrained on a frame which ſlides up or down, or turns about at pleaſure on a round wooden pillar, after the manner of ſome fire-ſcreens. Larger ſcreens may alſo be made of ſeveral ſheets of the ſame paper paſted together on cloth, and let down from the ceiling with a roller like a large map.

"This microſcope (ſays Mr Baker) is the moſt entertaining of any; and perhaps the moſt capable of making diſcoveries in objects that are not too opaque: as it ſhows them much larger than can be done any other way. There are alſo ſeveral conveniences attending it, which no other microſcope can have: for the weakeſt eyes may uſe it without the leaſt ſtraining or fatigue: numbers of people together may view any object at the ſame time; and by pointing to the particular parts thereof, and diſcourſing on what lies before them, may be able better to underſtand one another, and more likely to find out the truth, than in other microſcopes, where they muſt peep one after another, and perhaps ſee the object neither in the ſame light nor in the ſame poſition. Thoſe alſo, who have no ſkill in drawing, may, by this contrivance, eaſily ſketch out the exact figure of any object they have a mind to preſerve a picture of; ſince they need only faſten a paper on the ſcreen, and trace it

Microfcope it out thereon either with a pen or pencil, as it appears before them. It is worth the while of thofe who are defirous of taking many draughts in this way, to get a frame, wherein a fheet of paper may be put in or taken out at pleafure; for if the paper be fingle, the image of an object will be feen almoft as plainly on the back as on the fore-fide; and, by ftanding behind the fcreen, the fhade of the hand will not obftruct the light in drawing, as it muft in fome degree when one ftands before it." This conftruction, however, has now become rather obfolete, and is fuperfeded by the following.

II. *The improved Solar Microfcope, as ufed with the improved fingle Microfcope, with teeth and pinion.* Fig. 22. reprefents the whole form of the *fingle microfcope*; the parts of which are as follows: ABCD the external tube; GHIK the internal moveable one; QM part of another tube within the laft, at one end of which is fixed a plate of brafs hollowed in the middle, for receiving the glafs tubes: there is alfo a moveable flat plate, between which, and the fixed end of the fecond tube, the ivory fliders are to be placed. L, a part of the microfcope, containing a wire fpiral fpring, keeping the tube QM with its plates firm againft the fixed part IK of the fecond tube.

EF is the fmall rack-work of teeth and pinion, by which the tube IG is moved gradually to or from the end AB, for adjufting the objects exactly to the focus of different lengths. NO is a brafs flider, with fix magnifiers; any one of which may eafily be placed before the object. It is known when either of the glaffes is in the centre of the eye-hole, by a fmall fpring-falling into a notch in the fide of the flider, made againft each of the glaffes. Thofe parts of the apparatus, fig. 14. (Pl.cccxix.) marked n° 15, 16, 17, 18, 19, 20, 21. and 22. are made ufe of here to this microfcope. GH is a brafs cell, which holds an illuminating glafs for converging the fun's beams or the light of a candle ftrongly upon the objects. The aperture of the glafs is made greater or lefs, by two circular pieces of brafs, with holes of different fizes, that are fcrewed feparately over the faid lens. But at times, objects appear beft when the microfcope is held up to the common light only, without this glafs. It is alfo taken away when the microfcope is applied to the apparatus now to be defcribed.

Fig. 23. reprefents the apparatus, with the fingle microfcope fcrewed to it, which conftitutes the *Solar Microfcope*. AB is the inner moveable tube, to which the fingle microfcope is fcrewed. CD, is the external tube, containing a condenfing convex glafs at the end D, and is fcrewed into the plate EF, which is cut with teeth at its circumference, and moved by the pinion I, that is fixed with the plate GH. This plate is fcrewed faft againft the window-fhutter, or board fitted to a convenient window of a darkened room, when the inftrument is ufed. KL is a long frame, fixed to the circular plate EF; containing a looking-glafs or mirror for reflecting the folar rays through the lens in the body of the tube D. O is a brafs milled head, faftened to a worm or endlefs fcrew; which on the outfide turns a fmall wheel, by which the reflecting mirror M is moved upwards or downwards.

In *ufing* this microfcope, the fquare frame GH is firft to be fcrewed to the window-fhutter, and the room well darkened: which is beft done by cutting a round hole of the fize of the moveable plate EF, that carries the reflector, in the window-fhutter or board; and, by means of two brafs nuts *a a*, let into the fhutter to receive the fcrews PP, when placed through the holes in the fquare frame GH, at the two holes QQ; which will firmly faften the microfcope to the fhutter, and is eafily taken away by only unfcrewing the fcrews PP.

The white paper fcreen, or white cloth, to receive the images, is to be placed feveral feet diftant from the window: which will make the reprefentations the larger in proportion to the diftance. The ufual diftances are from 6 to 16 feet.

The frame KL, with its mirror M, is to be moved by turning the pinion I, one way or the other, till the beams of the fun's light come through the hole into the room: then, by turning of the worm at O, the mirror muft be raifed or depreffed till the rays become perfectly horizontal, and go ftraight acrofs the room to the fcreen. The tube CD, with its lens at D, is now to be fcrewed into the hole of the circular plate EF: by this glafs the rays will be converged to a focus; and from thence proceed diverging to the fcreen, and there make a large circle of light. The fingle microfcope, fig. 22. is to be fcrewed on to the end AB (fig. 23.) of the inner tube; and the flider NO, with either of the lenfes marked 1, 2, 3, 4, 5, or 6, in the centre of the hole at the end AB. This will occafion a circle of light upon the fcreen much larger than before. The flider or glafs-tube, with the objects to be viewed, is to be placed between the plates at IK againft the fmall magnifier, and moved at pleafure. By fhifting the tube AB in or out, you may place the object in fuch a part of the condenfed rays as fhall be fufficient to illuminate it, and not fcorch or burn it; which will generally require the glafs to be about one inch diftant from the focus. It now remains only to adjuft the object, or to bring it fo near to the magnifier that its image formed upon the fcreen fhall be the moft diftinct or perfect: and it is effected by gently turning the pinion F, fig. 22, a fmall matter one way or the other. If the object be rather large in fize, the leaft magnifiers are generally ufed, and *vice verfa*.

N° 1. is the greateft magnifier, and n° 6. the leaft, in the brafs flider NO. But, if defired, fingle lenfes of greater magnifying powers are made: and they are applied, by being fcrewed to the end A B, fig. 12. and the brafs flider N O is then taken away.

The fame object may be varioufly magnified, by the lenfes feverally applied to it; and the degree of magnifying power is eafily known by this rule: *As the diftance of the object is to that of its image from the magnifier; fo is the length or breadth of the object to that of the image.*

Inftead of the brafs fliders with the lenfes NO, there is fometimes fcrewed a lens of a large fize, and longer focal diftance: the inftrument is then converted into a *megalafcope*; and is adapted for viewing the larger kind of objects contained in large fliders, fuch as is reprefented at R. And, in the fame manner, fmall objects of entertainment, painted upon glafs like the fliders of a magic lanthorn, are much magnified, and reprefented upon the fame fcreen.

The folar microfcopes juft defcribed are capable only

Fig. 21.

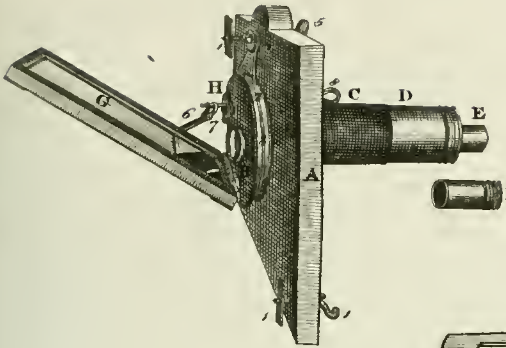


Fig. 25.

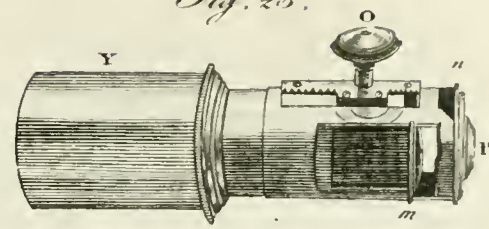


Fig. 23.

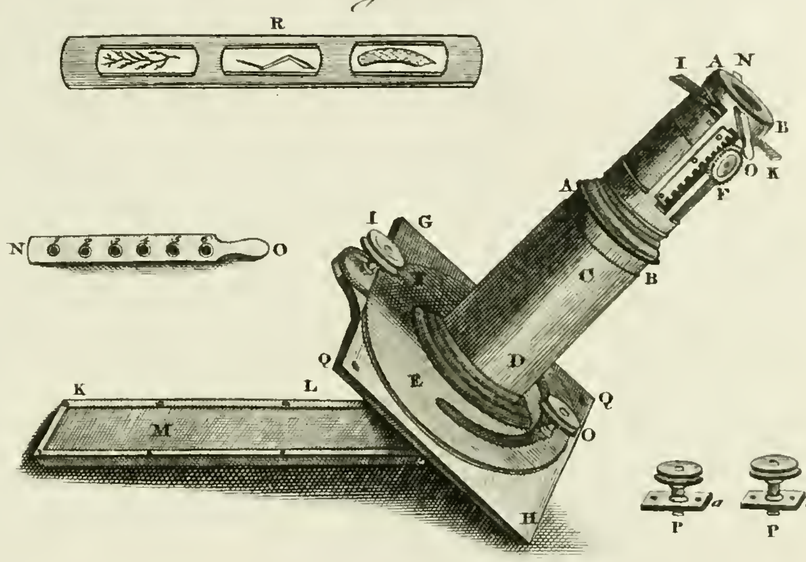


Fig. 22.

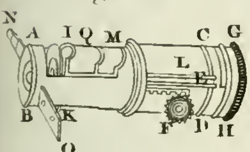
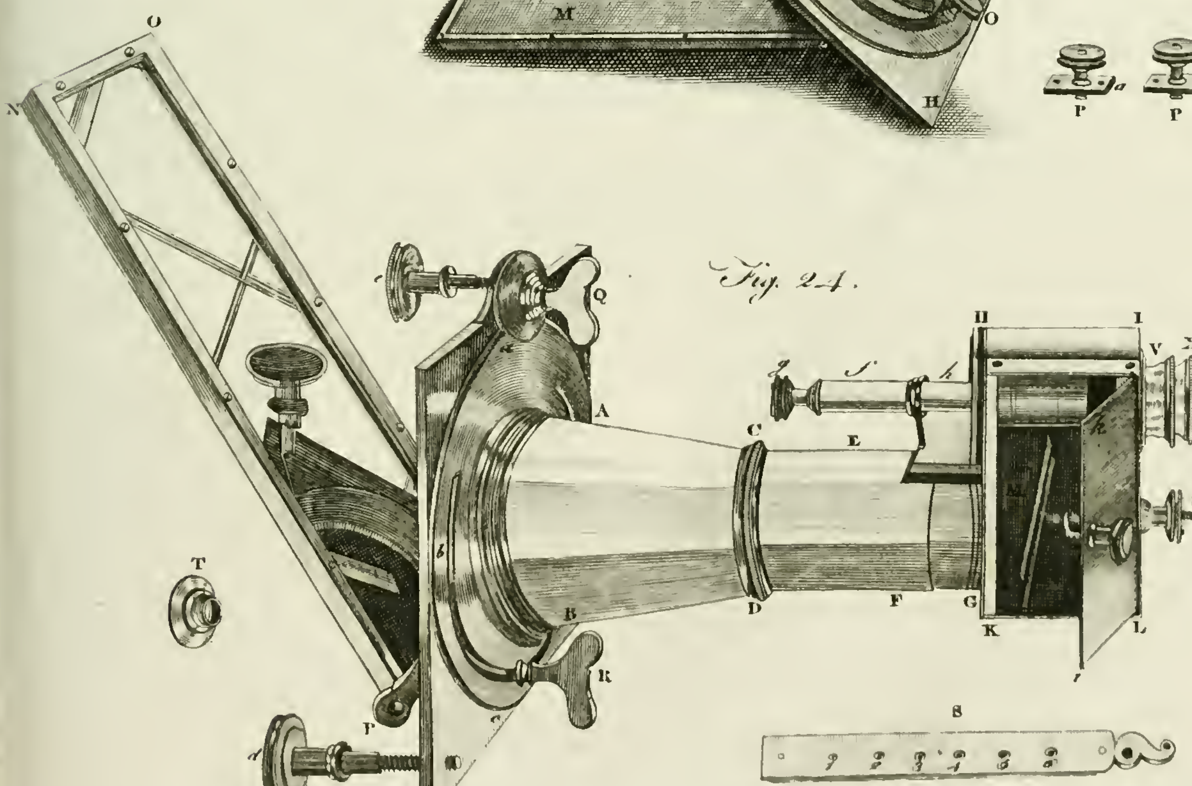


Fig. 24.



A. Bell. Prin. Pal. Sculptor fecit.

Microscope. ly of magnifying transparent objects; for which purpose the last instrument is extremely well adapted. But as opaque objects form the most considerable part of the curious collections in the works of art as well as nature, a solar microscope for this purpose was a long time wanted.—For several years previous to 1774, the late Mr Martin made several essays towards the construction of such an instrument; and at last completed one about the time just mentioned, which he named,

III. *The Opaque Solar Microscope.* With this instrument (to use his own words) all *opaque* objects, whether of the animal, vegetable, or mineral kingdom, may be exhibited in great perfection, in all their native beauty; the lights and shades, the prominences and cavities, and all the varieties of different hues, tints, and colours; heightened by reflection of the solar rays condensed upon them."—*Transparent objects* are also shown with greater perfection than by the common solar microscope.

Fig. 24. represents the solar opaque microscope, mounted for exhibiting opaque objects.

Fig. 25. is the single tooth-and-pinion microscope, as before, which is used for showing transparent objects; the cylindrical tube Y thereof being made to fit into the tube FE of the solar microscope.

ABCDEF, (fig. 24.) represents the body of the solar microscope; one part thereof, ABCD, is conical; the other, CDEF, is cylindrical. The cylindrical part receives the tube G of the opaque box, or the tube Y of the single microscope. At the large end AB of the conical part, there is a lens to receive the rays from the mirror, and refract them towards the box HIKL. NOP is a brass frame; which is fixed to the moveable circular plate *abc*: in this frame there is a plane mirror, to reflect the solar rays on the aforementioned lens. This mirror may be moved into the most convenient position for reflecting the light, by means of the nuts Q and R. By the nut Q it may be moved from east to west; and it may be elevated or depressed by the nut R. *de*, Two screws to fasten the microscope to a window-shutter. The box for opaque objects is represented at HIKL: it contains a plane mirror M, for reflecting the light which it receives from the large lens to the object. and thereby illuminating it; S is a screw to adjust this mirror, or place it at a proper angle for reflecting the light. VX, two tubes of brass, one sliding within the other, the exterior one in the box HIKL; these carry the magnifying lenses: the interior tube is sometimes taken out, and the exterior one is then used by itself. Part of this tube may be seen in the plate within the box HIKL. At H there is a brass plate, the back part of which is fixed to the hollow tube *h*, in which there is a spiral wire, which keeps the plate always bearing against the side H of the brass box HIKL. The sliders, with the opaque objects, pass between this plate and the side of the box; to put them there, the plate is to be drawn back by means of the nut *g*: *ik* is a door to one side of the opaque box. The foregoing pieces constitute the several parts necessary for viewing opaque objects. We shall now proceed to describe the single microscope, which is used for transparent objects: but in order to examine these, the box HIKL must be first removed, and in its place we must insert the tube Y of the single microscope that we are now going to describe.

Fig. 25. represents a large tooth-and-pinion microscope: at *m*, within the body of this microscope, are two thin plates, that are to be separated, in order to let the ivory sliders pass between them; they are pressed together by a spiral spring, which bears up the under plate, and forces it against the upper one.

The slider S (under fig. 24.), which contains the magnifiers, fits into the hole *n*; and any of the magnifiers may be placed before the object, by moving the aforesaid slider: when the magnifier is at the centre of the hole P, a small spring falls into one of the notches which is on the side of the slider.

Under the plate *m* are placed two lenses, for enlarging the field of view on the screen: the smaller of the two is fixed in a piece of brass, and is nearest the plate *m*; this is to be taken out when the magnifiers, N° 4, 5, or 6, are used, or when the megalascope lens T (fig. 24.) is used; but is to be replaced for N° 1, 2, 3.

This microscope is adjusted to the focus by turning the milled nut O.

To *use* the solar microscope:—Make a round hole in the window-shutter, a little larger than the circle *abc*; pass the mirror ONP through this hole, and apply the square plate to the shutter; then mark with a pencil the places which correspond to the two holes through which the screw is to pass; take away the microscope, and bore two holes at the marked places, sufficiently large to let the milled screws *de* pass through them.

The screws are to pass from the outside of the shutter, to go through it; and being then screwed into their respective holes in the square plate, they will, when screwed home, hold it fast against the inside of the shutter, and thus support the microscope.

Screw the conical tube ABCD to the circle *abc*, and then slide the tube G of the opaque box into the cylindrical part CD EF of the body, if opaque objects are to be examined; but if they be transparent objects you mean to show, then place the tube Y within the tube CDEF.

The room is to be darkened as much as possible, that no light may enter but what passes through the body of the microscope; for, on this circumstance, together with the brightness of the sun shine, the perfection and distinctness of the image in a great measure depend.

When the microscope is to be used for opaque objects, 1. Adjust the mirror NOP, so as to receive the solar rays, by means of the two finger screws or nuts, Q R; the first, Q, turns the mirror to the right or left; the second, R, raises or depresses it: this you are to do till you have reflected the sun's light through the lens at AB strongly upon a screen of white paper placed at some distance from the window, and formed thereon a round spot of light. An unexperienced observer will find it more convenient to obtain the light by forming this spot before he puts on either the opaque box or the tooth-and-pinion microscope.

Now put in the *opaque* box, and place the object between the plates at H; open the door *ik*, and adjust the mirror M till you have illuminated the object strongly. If you cannot effect this by the screw S, you

you must move the screws Q, R, in order to get the light reflected strongly from the mirror NOP, or the mirror M, without which the latter cannot illuminate the object.

The object being strongly illuminated, shut the door *ik*, and a distinct view of the object will soon be obtained on your screen, by adjusting the tubes VX, which is effected by moving them backwards or forwards.

A round spot of light cannot always be procured in northern latitudes, the altitude of the sun being often too low; neither can it be obtained when the sun is directly perpendicular to the front of the room.

As the sun is continually changing its place, it will be necessary, in order to keep his rays full upon the object, to keep them continually directed thro' the axis of the instrument, by the two screws Q and R.

To view *transparent* objects, remove the opaque box, and insert the tube Y, fig. 25. in its place; put the slider S into its place at *n*, and the slider with the objects between the plates at *m*; then adjust the mirror NOP, as before directed by the screws Q, R, so that the light may pass through the object; regulate the focus of the magnifier by the screw O. The most pleasing magnifiers in use are the fourth and fifth.

The size of the object may be increased or diminished, by altering the distance of the screen from the microscope: five or six feet is a convenient distance.

To examine transparent objects of a larger size, or to render the instrument what is usually called a *megalascope*, take out the slider S from its place at *n*, and screw the button T (fig. 24.) into the hole at P, fig. 25. and remove the glass which is under the plate at *m*, and regulate the light and focus agreeable to the foregoing directions.

N. B. At the end of the tube G there is a lens for increasing the density of the rays, for the purpose of burning or melting any combustible or fusible substance: this lens must be removed in most cases, lest the objects should be burnt. The intensity of the light is also varied by moving this tube backwards or forwards.

Apparatus of the Opaque Solar Microscope.—The large square plate and mirror; the body of the microscope; the opaque box and its tube; the tooth-and-pinion microscope; the slider with the magnifiers; the megalascope magnifier; the two screws *d* and *e*; some ivory sliders; some sliders with opaque objects; a brass frame, with a bottom of soft deal to stick any object on; a brass cylinder K (fig. 31.), for confining opaque objects.

IV. *The* CAMERA OBSCURA, *or* LUCERNAL, *Microscope.*—The great facility with which objects can be represented on paper or a rough glass in the camera obscura, and copies drawn from them by any person though unskilled in drawing, evidently suggested the application of the microscope to this instrument. The greatest number of experiments that appear to have been made with this view, were by the late Mr Martin and Mr Adams; the former of whom frequently applied the microscope to the portable camera, and with much effect and entertainment. But these instruments being found to answer only with the assistance of the sun, Mr Adams directed his experiments to the construction of an instrument of more extended utility, which could be equally employed in the day-time and by night. He accordingly succeeded so far as to produce, by *candle-light*, the images of objects refracted from a single magnifier upon one or two large convex lenses (of about five inches or upwards in diameter), at the end of a pyramidal shaped box, in a very pleasing and magnified appearance, so as to give opaque objects as well as transparent ones the utmost distinctness of representation: but still the light of a candle or lamp was found generally insufficient to throw the requisite degree of illumination upon the objects. The invention of what is called *Argand's lamp*, within these few years offered a complete remedy for this defect, by the intensity and steadiness of its light. This did not escape the present Mr Adams (son of the former), who immediately applied it; and who had likewise so altered and improved his father's instrument, both in construction and form, as to render it altogether a different one, and far more perfect and useful.

The advantages and properties of this excellently conceived instrument are numerous and important. "As the far greater part of the objects which surround us are opaque (says our author), and very few are sufficiently transparent to be examined by the common microscopes, an instrument that could be readily applied to the examination of opaque objects has always been a desideratum. Even in the examination of transparent objects, many of the fine and more curious portions are lost, and drowned, as it were, in the light which must be transmitted through them; while different parts of the same object appear only as dark lines or spots, because they are so opaque as not to permit any light to pass through them. These difficulties, as well as many more, are obviated in the lucernal microscope; by which opaque objects of various sizes may be seen with ease and distinctness: the beautiful colours with which most of them are adorned, are rendered more brilliant, without changing in the least the real tint of the colour; and the concave and convex parts retain also their proper form.—The facility with which all opaque objects are applied to this instrument, is another considerable advantage, and almost peculiar to itself; as the texture and configuration of the more tender parts are often hurt by previous preparation, every object may be examined by this instrument, first as opaque, and afterwards (if the texture will admit of it) as transparent.—The lucernal microscope does not in the least fatigue that eye; the object appears like nature itself, giving ease to the sight and pleasure to the mind: there is also, in the use of this instrument, no occasion to shut the eye which is not directed to the object. A further advantage peculiar to this microscope is, that by it the outlines of every object may be taken, even by those who are not accustomed to draw; while those who can draw well will receive great assistance, and execute their work with more accuracy and in less time than they would otherwise have been able to have performed it. Transparent objects as well as opaque may be copied in the same manner. The instrument may be used at any time of the day, but the best effect is by night; in which respect it has a superiority over the solar microscope, as that instrument can only be used when the sun shines.

Microscope

Transparent objects may be examined with the lucernal microscope in three or four different modes, from a blaze of light almost too great for the eye to bear, to that which is perfectly easy to it: And by the addition of a tin lanthorn to the apparatus, may be thrown on a screen, and exhibited at one view to a large company, as by the solar mircoscope.

We shall now proceed to the description of the instrument and apparatus as given by Mr Adams.

Fig. 26. represents the improved *Lucernal Microscope*, mounted to view opaque objects. ABCD is a large mahogany pyramidal box, which forms the body of the microscope; it is supported firmly on the brass pillar FG, by means of the socket H and the curved piece IK.

LMN is a guide for the eye, in order to direct it in the axis of the lenses; it consists of two brass tubes, one sliding within the other, and a vertical flat piece, at the top of which is the hole for the eye. The outer tube is seen at MN, the vertical piece is represented at LM. The inner tube may be pulled out, or pushed in, to adjust it to the focus of the glasses. The vertical piece may be raised or depressed, that the hole, through which the object is to be viewed, may coincide with the centre of the field of view; it is fixed by a milled screw at M, which could not be shown in this figure.

At N is a dove-tailed piece of brass, made to receive the dove-tail at the end of the tubes MN, by which it is affixed to the wooden box ABCDE. The tubes MN may be removed from this box occasionally, for the convenience of packing it up in a less compass.

OP, a small tube which carries the magnifiers.

O, one of the magnifiers; it is screwed into the end of a tube, which slides within the tube P; the tube P may be unscrewed occasionally from the wooden body.

QRSTVX, a long squarebar, which passes through the sockets YZ, and carrries the stage or frame that holds the objects; this bar may be moved backward or forward, in order to adjust it to the focus by means of the pinion which is at *a*.

b, A handle furnished with an universal joint, for more conveniently turning the pinion. When the handle is removed, the nut (fig. 27.) may be used in its stead.

de, A brass bar, to support the curved piece KI, and keep the body AB firm and steady.

fghi, The stage for opaque objects: it fits upon the bar QRST by means of the socket *hi*, and is brought nearer to or removed farther from the magnifying lens by turning the pinion *a*: the objects are placed in the front side of the stage (which cannot be seen in this figure) between four small brass plates; the edges of two of these are seen at *kl*. The two upper pieces of brass are moveable; they are fixed to a plate, which is acted on by a spiral spring, that presses them down, and confines the slider with the objects: this plate, and the two upper pieces of brass, are lifted up by the small nut *m*.

At the lower part of the stage, there is a semicircular lump of glass *n*, which is designed to receive the light from the lamp, fig. 29. and to collect and throw it on the concave mirror *o*, whence it is to be reflected on the object.

The upper part *fgrs* (fig. 26.) of the opaque stage takes out, that the stage for transparent objects may be inserted in its place.

Fig. 28. represents the stage for transparent objects; the two legs 5 and 6 fit into the top of the under part *rshi* of the stage for opaque objects; 7 is the part which confines or holds the sliders, and through which they are to be moved; 9 and 10 a brass tube, which contains the lenses for condensing the light, and throwing it upon the object; there is a second tube within that, marked 9 and 10, which may be placed at different distances from the object by the pin 11.

When this stage is used as a single microscope, without any reference to the lucernal, the magnifiers, or object lenses, are to be screwed into the hole 12, and to be adjusted to a proper focus by the nut 13.

N. B. At the end AB (fig 26.) of the wooden body there is a slider, which is represented as partly drawn out at A: when quite taken out, three grooves will be perceived; one of which contains a board that forms the end of the box; the next contains a frame with a greyed glass; and the third, or that farthest from the end AB, two large convex lenses.

Fig. 29. represents one of Argand's lamps, which are the most suitable for microscopic purposes, on account of the clearness, the intensity, and the steadiness of the light. The following account of the method of managing them, with other observations, is copied from an account given by Mr Parker with those he sells.

The principle on which the lamp acts, consists in disposing the wick in thin parts, so that the air may come into contact with all the burning fuel; by which means, together with an increase of the current of air occasioned by rarefaction in the glass tube, the whole of the fuel is converted into flame.

The wicks are circular; and, the more readily to regulate the quantity of light, are fixed on a brass collar, with a wire handle, by means of which they are raised or depressed at pleasure.

To fix the wick on, a wooden mandril is contrived, which is tapered at one end, and has a groove turned at the other.

The wick has a selvage at one end, which is to be put foremost on the mandril, and moved up to the groove; then putting the groove into the collar of the wick-holder, the wick is easily pushed forward upon it.

The wick-holder and wick being put quite down in their place, the spare part of the wick should, while dry, be set a-light, and suffered to burn to the edge of the tubes; this will leave it more even than by cutting, and, being black by burning, will be much easier lighted: for this reason, the black should never be quite cut off.

The lamp should be filled an hour or two before it is wanted, that the cotton may imbibe the oil and draw the better.

The lamps which have a reservoir and valve, need no other direction for filling than to do it with a proper trimming pot, carefully observing when they are full; then pulling up the valve by the point, the reservoir, being turned with the other hand, may be replaced without spilling a drop.

Those lamps which fill in the front like a bird fountain, must be reclined on the back to fill; and this

Microscope. should be done gently, that the oil in the burner may return into the body when so placed and filled: if, by being too full, any oil appears above the guard, only move the lamp a little, and the oil will disappear; the lamp may then be placed erect, and the oil will flow to its proper level.

The oil must be of the spermaceti kind, commonly called chamber-oil, which may generally be distinguished by its paleness, transparency, and inoffensive scent: all those oils which are of a red and brown colour, and of an offensive scent, should be carefully avoided, as their glutinous parts clog the lamp, and the impurities in such oil, not being inflammable, will accumulate and remain in the form of a crust on the wick. Seal oil is nearly as pale and sweet as chamber oil; but being of a heavy sluggish quality, is not proper for lamps with fine wicks.

Whenever bad oil has been used, on changing it, the wick must also be changed; because, after having imbibed the coarse particles in its capillary tubes, it will not draw up the fine oil.

To obtain the greatest degree of light, the wick should be trimmed exactly even, the flame will then be completely equal.

There will be a great advantage in keeping the lamp clean, especially the burner and air-tubes; the neglect of cleanliness in lamps is too common: a candlestick is generally cleaned every time it is used, so should a lamp; and if a candlestick is not to be objected to because it does not give light after the candle is exhausted, so a lamp should not be thought ill of, if it does not give light when it wants oil or cotton; but this last has often happened, because the deficiency is less visible.

The glass tubes are best cleaned with a piece of wash leather.

If a fountain-lamp is left partly filled with oil, it may be liable to overflow; this happens by the contraction of the air when cold, and its expansion by the warmth of a room, the rays of the sun, or the heat of the lamp when re-lighted: this accident may be effectually prevented by keeping the reservoir filled, the oil not being subject to expansion like air. On this account, those with a common reservoir are best adapted for microscopic purposes.

To examine Opaque Objects with the Lucernal Microscope. To render the use of this instrument easy, it is usually packed with as many of the parts together as possible: it occupies on this account rather more room, but is much less embarrassing to the observer, who has only three parts to put on after it is taken out of its box, namely, the guide for the eye, the stage, and the tube with its magnifier.

But to be more particular: Take out the wooden slider A (fig. 26.), then lift out the cover and the grey glass from their respective grooves under the slider A.

Put the end N of the guide for the eye LMM into its place, so that it may stand in the position which is represented in this figure.

Place the socket which is at the bottom of the opaque stage, on the bar Q X T, so that the concave mirror *o* may be next the end DE of the wooden body.

Screw the tubes PO into the end DE. The magnifier you intend to use is to be screwed on the end O of these tubes. Microscope.

The handle G*b*, or the milled nut fig. 27. must be placed on the square end of the pinion *a*.

Place the lamp lighted before the glass lump *n*, and the object you intend to examine between the spring-plates of the stage; and the instrument is ready for use.

In all microscopes there are two circumstances which must be particularly attended to: first, the modification of the light, or the proper quantity to illuminate the object; secondly, the adjustment of the instrument to the focus of the glasses and eye of the observer. In the use of the lucernal microscope there is a third circumstance, which is, the regulation of the guide for the eye.

1. To throw the light upon the object. The flame of the lamp is to be placed rather below the centre of the glass lump *n*, and as near it as possible; the concave mirror *o* must be so inclined and turned as to receive the light from the glass lump, and reflect it thence upon the object; the best situation of the concave mirror and the flame of the lamp depends on a combination of circumstances, which a little practice will discover.

2. To regulate the guide for the eye, or to place the centre of the eye-piece L so that it may coincide with the focal point of the lenses and the axis of vision: Lengthen and shorten the tubes MN, by drawing out or pushing in the inner tube, and raising or depressing the eye-piece ML, till you find the large lens (which is placed at the end AB of the wooden body) filled by an uniform field of light, without any prismatic colours round the edge; for till this piece is properly fixed, the circle of light will be very small, and only occupy a part of the lens: the eye must be kept at the centre of the eye-piece L, during the whole of the operation; which may be rendered somewhat easier to the observer, on the first use of the instrument, if he hold a piece of white paper parallel to the large lens, removing it from or bringing it nearer to them till he find the place where a lucid circle, which he will perceive on the paper, is brightest and most distinct; then he is to fix the centre of the eye-piece to coincide with that spot; after which a very small adjustment will set it perfectly right.

3. To adjust the lenses to their focal distance. This is effected by turning the pinion *a*, the eye being at the same time at the eye-piece L. The grey glass is often placed before the large lenses, while regulating the guide for the eye, and adjusting for the focal distance.

If the observer, in the process of his examination of an object, advance rapidly from a shallow to a deep magnifier, he will save himself some labour by pulling out the internal tube at O.

The upper part *f g r s* of the stage is to be raised or lowered occasionally, in order to make the centre of the object coincide with the centre of the lens at O.

To delineate objects, the grey glass must be placed before the large lenses; the picture of the object will be formed on this glass, and the outline may be accurately taken by going over the picture with a pencil.

The


Fig. 26.
Fig. 27.
Fig. 28.
Fig. 29.
Fig. 30.
Fig. 31.

The opaque part may be uſed in the day-time without a lamp, provided the large lenſes at AB are ſcreened from the light.

To uſe the Lucernal Microſcope in the examination of Tranſparent Objects. The inſtrument is to remain as before: the upper part *fgs* of the opaque ſtage muſt be removed, and the ſtage for tranſparent objects, repreſented at fig. 28. put in its place; the end 9 10 to be next the lamp.

Place the greyed glaſs in its groove at the end AB, and the objects in the ſlider-holder at the front of the ſtage; then tranſmit as ſtrong a light as you are able on the object, which you will eaſily do by raiſing or lowering the lamp.

The object will be beautifully depicted on the grey glaſs: it muſt be regulated to the focus of the magnifier, by turning the pinion *a*.

The object may be viewed either with or without the guide for the eye. A ſingle obſerver will ſee an object to the greateſt advantage by uſing this guide, which is to be adjuſted as we have deſcribed above. If two or three wiſh to examine the object at the ſame time, the guide for the eye muſt be laid aſide.

Take the large lens out of the groove, and receive the image on the grey glaſs; in this caſe, the guide for the eye is of no uſe: if the grey glaſs be taken away, the image of the object may be received on a paper ſcreen.

Take out the grey glaſs, replace the large lenſes, and uſe the guide for the eye; attend to the foregoing directions, and adjuſt the object to its proper focus. You will then ſee the object in a blaze of light almoſt too great for the eye, a circumſtance that will be found very uſeful in the examination of particular objects. The edges of the object in this mode will be ſomewhat coloured: but as it is only uſed in this full light for occaſional purpoſes, it has been thought better to leave this ſmall imperfection, than, by remedying it, to ſacrifice greater advantages; the more ſo, as this fault is eaſily corrected, and a new and intereſting view of the object is obtained, by turning the inſtrument out of the direct rays of light, and permitting them to paſs through only in an oblique direction, by which the upper ſurface is in ſome degree illuminated, and the object is ſeen partly as opaque, partly as tranſparent. It has been already obſerved, that the tranſparent objects might be placed between the ſlider-holders of the ſtage for opaque objects, and then be examined as if opaque.

Some tranſparent objects appear to the greateſt advantage when the lens at 9 10 is taken away; as, by giving too great a quantity of light, it renders the edges leſs ſharp.

The variety of views which may be taken of every object by means of the improved lucernal microſcope, will be found to be of great uſe to an accurate obſerver: it will give him an opportunity of correcting or confirming his diſcoveries, and inveſtigating thoſe parts in one mode which are inviſible in another.

To throw the image of tranſparent objects on a ſcreen, as in the ſolar microſcope. It has been long a microſcopical deſideratum, to have an inſtrument by which the image of tranſparent objects might be thrown on a ſcreen, as in the common ſolar microſcope: and this not only becauſe the ſun is ſo uncertain in this climate, and the uſe of the ſolar microſcope requires confinement in the fineſt part of the day, when time ſeldom hangs heavy on the mind; but as it alſo affords an increaſe of pleaſure, by diſplaying its wonders to ſeveral perſons at the ſame inſtant, without the leaſt fatigue to the eye.

This purpoſe is now effectually anſwered, by affixing the tranſparent ſtage of the lucernal to a lanthorn, with one of Argand's lamps.—The lamp is placed within the lanthorn, and the end 9 10 of the tranſparent ſtage is ſcrewed into a female ſcrew, which is rivetted in the ſliding part of the front of the lanthorn: the magnifying lenſes are to be ſcrewed into the hole repreſented at 12, and they are adjuſted by turning the milled nut. The quantity of light is to be regulated by raiſing and lowering the ſliding-plate or the lamp.

Apparatus which uſually accompanies the improved Lucernal Microſcope. The ſtage for opaque objects, with its ſemicircular lump of glaſs, and concave mirror. The ſtage for tranſparent objects, which fits on the upper part of the foregoing ſtage. The ſliding tube, to which the magnifiers are to be affixed: one end of theſe is to be ſcrewed on the end D of the wooden body; the magnifier in uſe is to be ſcrewed to the other end of the inner tube. Eight magnifying lenſes: theſe are ſo conſtructed, that they may be combined together, and thus produce a very great variety of magnifying powers. A fiſh-pan, ſuch as is repreſented at I. A ſteel wire L, with a pair of nippers at one end, and a ſmall cylinder of ivory *l* at the other. A ſlider of braſs N, containing a flat glaſs ſlider, and a braſs ſlider into which are fitted ſome ſmall concave glaſſes. A pair of forceps. Six large and ſix ſmall ivory ſliders, with tranſparent objects. Fourteen wooden ſliders, with four opaque objects in each ſlider; and two ſpare ſliders. Some capillary tubes for viewing ſmall animalcula.

Ingenious men ſeldom content themſelves with an inſtrument under one form; hence ſuch a variety of microſcopes, hence many alterations in the Lucernal Microſcope. Mr Adams himſelf, we underſtand, has fitted up this laſt in a great many different ways; and it is reaſonable to think that no perſon is more likely to give it every improvement of which is is ſuſceptible. Of the alterations by other hands we ſhall only particulariſe one, made by Mr Jones of Holborn (B), whoſe deſcription is as follows:

A, repreſents a portion of the top of the mahogany box

(B) We truſt the reader will never conſider any paragraph wherein the name of an inſtrument-maker or other artiſt is inſerted, as a recommendation of thoſe artiſts by the editors of this work. In the courſe of a pretty extenſive correſpondence, they have been favoured with very liberal communications from various artiſts, for which they are greatly indebted to them: the inſerting their names in this work is therefore to be conſidered as a grateful acknowledgment from the editors for favours conferred on them,—not as a teſtimonial box in which it packs, to preserve it steady; it slides in a dove-tail groove withinside, a similar groove to which is cut in the top of the box A; so that when the instrument is to be used, it is slipt out of the box withinside, and then slipt into the groove at top ready for use, almost instantly, as shown in the figure. The adjustment of the objects is at the stage E; for the right focal distance is readily and conveniently made by turning the long screw-rod BB, which goes thro' the two pillars supporting the box, and works in the base of the brass stage E; which base is also dove-tailed, so as to have a regular and steady motion in another brass basis that supports it. In this instrument, therefore, the pyramidical box does not move; but the stage part only, which, from its small weight, moves in the most agreeable and steady manner. While observing the image of the object upon the glass through the sight-hole at G, the object may be moved or changed by only turning the rack-work and pinion applied to the stage, by means of the handle D, for that purpose. By this contrivance you have no occasion to change your position during the view of the objects upon one of the sliders. This motion changes the objects horizontally only; and as they are generally placed exactly in one line, it answers all the purposes for which this motion is intended very well. But it may sometimes happen that the observer would wish to alter the vertical position of the object; to perform which there is another plane rod at F, that acts simply as a lever for this purpose, and moves the sliding part of the stage E vertically either upwards or downwards.

Thus, without altering his position, the observer may investigate all parts of the objects in the most satisfactory manner. Rack-work and pinion might be applied to the stage for the vertical motion also; but as it would materially enhance the expence, it is seldom applied. The brass work at the handle of D contains a Hooke's universal joint.

The brilliancy of the images of the objects shown upon the large lenses at the end of the box, being very frequently so great as to dazzle the eyes. Mr Jones applies a slight tinge of blue, green, and other coloured glass, to the sight-hole at G, which softens this glare, and casts an agreeable hue upon the objects.

Description of those Parts of a Microscopical Apparatus, common to most Instruments, which are delineated at fig. 31.

A and B represent the brass cells which contain the magnifiers belonging to the different kinds of compound microscopes. The magnifiers are sometimes contained in a slider like that which is delineated at S (fig. 24). The lenses of A and B are confined by a small cap; on unscrewing this, the small lens may be taken out and cleaned. The magnifiers A of the lucernal microscope are so contrived, that any two of them may be screwed together, by which means a considerable variety of magnifying power is obtained.

To get at the lenses in the slider S (fig. 24.), take out the two screws which hold on the cover.

C, represents the general form of the slider-holder. It consists of a cylindrical tube, in which an inner tube is forced up by a spring It is used to receive the ivory or any other slider, in which the transparent objects are placed; these are to be slid between the two upper plates: the hollow part in one of the plates is designed for the glass tubes.

D, the condensing lens and its tube, which fits into the slider-holder C, and may be moved up and down in it. When this piece is pushed up as far as it will go, it condenses the light of a candle, which is reflected on it by the plain mirror of the compound microscope, and spreads it uniformly over the object; in this case it is best adapted to the shallowest magnifiers. If the deeper lenses are used, it should be drawn down, or rather removed further from the object, that it may concentrate the light in a small compass, and thus render it more dense. The condensing lens is sometimes fitted up differently; but the principle being the same, it will be easy to apply it to use notwithstanding some variations in the mechanism.

E, a brass cone. It fixes under the slider-holder, and is used to lessen occasionally the quantity of light which comes from the mirror to any object.

F, a box with two flat glasses, which may be placed at different distances from each other in order to confine a small living insect.

G, a small brass box to hold the silver speculum H.

H, a small silver concave speculum, designed to reflect the light from the mirror on opaque objects; it should only be used with the shallow magnifiers. It is applied in different ways to the compound microscope; sometimes to a tube similar to that represented at X, which slides on the lower part of the body; sometimes it is screwed into the ring of the piece Q; the pin of this generally fits into one of the holes in the stage. When this speculum is used, the slider-holder should be removed.

I, a fish-pan, whereon a small fish may be fastened, in order to view the circulation of the blood: its tail is to be spread across the oblong hole at the smallest end, and tied fast by means of the ribbon fixed thereto, by shoving the knob which is on the back of it through the slit made in the stage; the tail of the fish may be brought under the lens which is in use.

K, a cylindrical piece, intended for the solar opaque microscope: by pulling back the spiral spring, smaller or larger objects may be confined in it.

k, A pair of triangular nippers for taking hold of and confining a large object.

L, a long steel wire, with a small pair of pliers at one end and a steel point at the other: the wire slips backwards or forwards in a spring tube, which is affixed to a joint, at the bottom of which is a pin to fit one of the holes in the stage; this piece is used to confine small objects.

l, A small ivory cylinder that fits on the pointed end of the steel wire L; it is designed to receive opaque objects. Light-coloured ones are to be stuck on the dark side, and *vice versa*.

M, a convex lens, which fits to the stage by means of

nial of their opinion of the abilities of an individual, or as designed to insinuate any preference over others in the same line, where such preference has not been already bestowed by the public.

of the long pin adhering to it. This piece is defigned to collect the light from the fun or a candle, and to throw them on any object placed on the ftage; but it is very little ufed at prefent.

N, a brafs flider, into which is fitted a flat piece of glafs, and a brafs flider containing four fmall glaffes, one or two of them concave, the others flat; it is defigned to confine fmall living objects, and when ufed is to be placed between the two upper plates of the flider-holder.

O, a glafs tube to receive a fmall fifh, &c.

P, reprefents one of the ivory fliders, wherein objects are placed between two pieces of talc, and confined by a brafs ring.

Q, a piece to hold the fpeculum H: this piece is generally fitted to the microfcope reprefented at fig. 12.

R, a pair of forceps, to take up any occafional object.

S, a camel's hair pencil to brufh the duft off the glaffes; the upper part of the quill is fcooped out, to take up a drop of any fluid, and place it on either of the glaffes for examination.

T, an inftrument for cutting thin tranfverfe fections of wood. It confifts of a wooden bafe, which fupports four brafs pillars; on the top of the pillars is placed a flat piece of brafs, near the middle of which there is a triangular hole.

A fharp knife, which moves in a diagonal direction, is fixed on the upper fide of the afore-mentioned plate, and in fuch a manner that the edge always coincides with the furface thereof.

The knife is moved backwards and forwards by means of the handle *a*. The piece of wood is placed in the triangular trough which is under the brafs plate, and is to be kept fteady therein by a milled fcrew which is fitted to the trough; the wood is to be preffed forward for cutting by the micrometer fcrew *b*.

The pieces of wood fhould be applied to this inftrument immediately on being taken out of the ground, or elfe they fhould be foaked for fome time in water, to foften them fo that they may not hurt the edge of the knife.

When the edge of the knife is brought in contact with the piece of wood, a fmall quantity of fpirits of wine fhould be poured on the furface of the wood, to prevent its curling up; it will alfo make it adhere to the knife, from which it may be removed by preffing a piece of blotting paper on it.

y, An appendage to the cutting engine, which is to be ufed inftead of the micrometer fcrew, being preferred to it by fome. It is placed over the triangular hole, and kept flat down upon the furface of the brafs plate, while the piece of wood is preffed againft a circular piece of brafs which is on the under fide of it. This circular piece of brafs is fixed to a fcrew, by which its diftance from the flat plate on which the knife moves may be regulated.

z, An ivory box, containing at one end fpare talc for the ivory fliders, and at the other fpare rings for preffing the talcs together and confining them to the flider.

After what has been related of Microfcopes, they cannot be faid to be complete without the valuable addition of a *micrometer*; for the ufe and advantages of which, fee the article Micrometer.

Having prefented our readers with defcriptions of the various mifcrofcopes generally ufed, we think it our duty to point out to them thofe which we conceive to be beft calculated to anfwer the purpofes of fcience. The firft which prefents itfelf to our mind is that of *Ellis*: It is better adapted, than any other portable microfcope, to the purpofe of general obfervation; fimple in its conftruction, and general in its application. To thofe who prefer a double microfcope, we fhould recommend that figured in Plate CCXCVIII. (12.) If opaque objects, as infects, &c. be fubjects of inveftigation, the *Lucernal Microfcope* claims the preference: but if amufement alone guides the choice, the *Solar Microfcope* muft be fixed upon.

We fhall now proceed to explain fome neceffary particulars refpecting the method of ufing microfcopes; after which, we fhall fubjoin an enumeration of the principal objects difcovered or elucidated by their means. On this fubject Mr Adams, in his *Effay on the Microfcope*, has been very copious; with a view, as he informs us, to remove the common complaint made by Mr Baker, "that many of thofe who purchafe microfcopes are fo little acquainted with their general and extenfive ufefulnefs, and fo much at a lofs for objects to examine by them, that after diverting their friends fome few times with what they find in the fliders which generally accompany the inftrument, or perhaps with two or three common objects, the microfcope is laid afide as of little further value; whereas no inftrument has yet appeared in the world capable of affording fo conftant, various, and fatisfactory an entertainment to the mind."

I. In ufing the microfcope, there are three things neceffary to be confidered. (1.) The preparation and adjuftment of the inftrument itfelf. (2.) The proper quantity of light, and the beft method of adapting it to the object. (3.) The method of preparing the objects, fo that their texture may be properly underftood.

1. With regard to the microfcope itfelf, the firft thing neceffary to be examined is, whether the glaffes be clean or not: if they are not fo, they muft be wiped with a piece of foft leather, taking care not to foil them afterwards with the fingers; and, in replacing them, care muft be taken not to place them in an oblique fituation. We muft likewife be careful not to let the breath fall upon the glaffes, nor to hold that part of the body of the inftrument where the glaffes are placed with a warm hand; becaufe thus the moifture expelled by the heat from the metal will condenfe upon the glafs, and prevent the object from being diftinctly feen. The object fhould be brought as near the centre of the field of view as poffible; for there only it will be exhibited in the greateft perfection. The eye fhould be moved up and down from the eye-glafs of a compound microfcope, till the fituation is found where the largeft field and moft diftinct view of the object are to be had: but every perfon ought to adjuft the microfcope to his own eye, and not to depend upon the fituation it was placed in by another. A fmall magnifying power fhould

always be begun with; by which means the obſerver will beſt obtain an exact idea of the ſituation and connection of the whole; and will of conſequence be leſs liable to form any erroneous opinion when the parts are viewed ſeparately by a lens of greater power. Objects ſhould alſo be examined firſt in their moſt natural poſition: for if this be not attended to, we ſhall be apt to form very inadequate ideas of the ſtructure of the whole, as well as of the connection and uſe of the parts. A living animal ought to be as little hurt or diſcompoſed as poſſible.

From viewing an object properly, we may acquire a knowledge of its nature: but this cannot be done without an extenſive knowledge of the ſubject, much patience, and many experiments; as in a great number of caſes the images will reſemble each other, though derived from very different ſubſtances. Mr Baker therefore adviſes us not to form an opinion too ſuddenly after viewing a microſcopical object; nor to draw our inferences till after repeated experiments and examinations of the object in many different lights and poſitions; to paſs no judgment upon things extended by force, or contracted by dryneſs, or in any manner out of a natural ſtate, without making ſuitable allowances. The true colour of objects cannot be properly determined by very great magnifiers; for as the pores and interſtices of an object are enlarged according to the magnifying power of the glaſſes made uſe of, the component particles of its ſubſtance will appear ſeparated many thouſand times farther aſunder than they do to the naked eye: hence the reflection of the light from theſe particles will be very different, and exhibit different colours. It is likewiſe ſomewhat difficult to obſerve opaque objects; and as the apertures of the larger magnifiers are but ſmall, they are not proper for the purpoſe. If an object be ſo very opaque, that no light will paſs through it, as much as poſſible muſt be thrown upon the upper ſurface of it. Some conſideration is likewiſe neceſſary in forming a judgment of the motion of living creatures, or even of fluids, when ſeen through the microſcope; for as the moving body, and the ſpace wherein it moves, are magnified, the motion will alſo be increaſed.

2. On the management of the light depends in a great meaſure the diſtinctneſs of the viſion: and as, in order to have this in the greateſt perfection, we muſt adapt the quantity of light to the nature of the object and the focus of the magnifier, it is therefore neceſſary to view it in various degrees of light. In ſome objects, it is difficult to diſtinguiſh between a prominence and a depreſſion, a ſhadow or a black ſtain; or between a reflection of light and whiteneſs, which is particularly obſervable in the eye of the libella and other flies: all of theſe appearing very different in one poſition from what they do in another. The brightneſs of an object likewiſe depends on the quantity of light, the diſtinctneſs of viſion, and on regulating the quantity to the object; for ſome will be in a manner loſt in a quantity of light ſcarce ſufficient to render another viſible.

There are various ways in which a ſtrong light may be thrown upon objects; as by means of the ſun and a convex lens. For this purpoſe, the microſcope is to be placed about three feet from a ſouthern window; then take a deep convex lens, mounted on a ſemicircle and ſtand, ſo that its poſition may eaſily be varied: place this lens between the object and the window, ſo that it may collect a conſiderable number of ſolar rays, and refract them on the object or the mirror of the microſcope. If the light thus collected from the ſun be too powerful, it may be leſſened by placing a piece of oiled paper, or a piece of glaſs lightly greyed, between the object and lens. Thus a proper degree of light may be obtained, and diffuſed equally all over the ſurface of an object: a circumſtance which ought to be particularly attended to; for if the light be thrown irregularly upon it, no diſtinct view can be obtained. If we mean to make uſe of the ſolar light, it will be found convenient to darken the room, and to reflect the rays of the ſun on the abovementioned lens by means of the mirror of a ſolar microſcope fixed to the window-ſhutter; for thus the obſerver will be enabled to preſerve the light on his object, notwithſtanding the motion of the ſun. But by reaſon of this motion, and the variable ſtate of the atmoſphere, ſolar obſervations are rendered both tedious and inconvenient: whence it will be proper for the obſerver to be furniſhed with a large tin lanthorn, formed ſomething like the common magic lanthorn, capable of containing one of Argand's lamps. This, however, ought not to be of the fountain kind, leſt the rarefaction of the air in the lanthorn ſhould force the oil over. There ought to be an aperture in the front of the lanthorn, which may be moved up and down, and be capable of holding a lens; by which means a pleaſant and uniform as well as ſtrong light may eaſily be procured. The lamp ſhould likewiſe move on a rod, ſo that it may be eaſily raiſed or depreſſed. This lanthorn may likewiſe be uſed for many other purpoſes; as viewing of pictures, exhibiting microſcopic objects on a ſcreen, &c. A weak light, however, is beſt for viewing many tranſparent objects: among which we may reckon the prepared eyes of flies, as well as the animalcules in fluids. The quantity of light from a lamp or candle may be leſſened by removing the microſcope to a greater diſtance from them, or by diminiſhing the ſtrength of the light which falls upon the objects. This may very conveniently be done by pieces of black paper with circular apertures of different ſizes, and placing a larger or ſmaller one upon the reflecting mirror, as occaſion may require. There is an oblique ſituation of the mirrors, which makes likewiſe an oblique reflection of the light eaſily diſcovered by practice, (but for which no general rule can be given in theory); and which will exhibit an object more diſtinctly than any other poſition, ſhowing the ſurface, as well as thoſe parts through which the light is tranſmitted. The light of a lamp or candle is generally better for viewing microſcopic objects than day-light; it being more eaſy to modify the former than the latter, and to throw it upon the objects with different degrees of denſity.

3. With regard to the preparation of objects, Swammerdam has, in that particular, excelled almoſt all other inveſtigators who either preceded or have ſucceeded him. He was ſo aſſiduous and indefatigable, that neither difficulty nor diſappointment could make the leaſt impreſſion upon him; and he never abandoned the purſuit of any object until he had obtained

Microscope tained a satisfactory idea of it. Unhappily, however, the methods he made use of in preparing his objects for the microscope are now enerely unknown. Dr Boerhaave examined with the strictest attention all the letters and manuscripts of Swammerdam which he could find; but his researches were far from being successful. The following particulars, however, have thus come to the knowledge of the public.

For dissecting of *small insects*, Swammerdam had a brass table made by S. Muschenbrock, to which were affixed two brass arms moveable at pleasure to any part of it. The upper part of these vertical arms was constructed in such a manner as to have a slow vertical motion; by which means the operator could readily alter their height as he saw convenient. One of these arms was to hold the minute objects, and the other to apply the microscope.

The lenses of Swammerdam's microscopes were of various sizes as well as foci; but all of them the best that could be procured, both for the transparency of the glass and the fineness of the workmanship. His observations were always begun with the smallest magnifiers, from which he proceeded to the greatest; but in the use of them, he was so exceedingly dexterous, that he made every observation subservient to that which succeeded it, and all of them to the confirmation of each other, and to the completing of the description. His chief art seems to have been in constructing scissars of an exquisite fineness, and making them very sharp. Thus he was enabled to cut very minute objects to much more advantage than could be done by knives and lancets; for these, though ever so sharp and fine, are apt to disorder delicate substances by displacing some of the filaments, and drawing them after them as they pass through the bodies; but the sciffars cut them all equally. The knives, lancets, and styles he made use of in his dissections, were so fine that he could not see to sharpen them without the assistance of a magnifying glass; but with these he could dissect the intestines of bees with the same accuracy that the best anatomists can do those of large animals. He made use also of very small glass tubes no thicker than a bristle, and drawn to a very fine point at one end, but thicker at the other. These were for the purpose of blowing up, and thus rendering visible the smallest vessels which could be discovered by the microscope; to trace their courses and communications, or sometimes to inject them with coloured liquors.

Swammerdam sometimes made use of spirit of wine, water, or oil of turpentine, for suffocating the insects he wished to examine; and would preserve them for a time in these liquids. Thus he kept the parts from putrefying, and gave them besides such additional strength and firmness, as rendered the dissections much more easy than they would otherwise have been. Having then divided the body transversely with the sciffars, and made what observations he could without farther dissection, he proceeded to extract the intestines carefully with very fine instruments, to wash away the fat in the like careful manner; and thus to put the parts into such a state as would best expose them to view; but these operations are best performed while the insects are in their nympha state.

Sometimes the delicate viscera of the insects, after having been suffocated as abovementioned, were put into water; after which, having shaken them gently, he procured an opportunity of examining them, especially the air vessels, which last he could thus separate entire from all the other parts, to the admiration of all who beheld them; as these vessels cannot be distinctly seen in any other manner, or indeed in any way whatever, without injuring them. Frequently also he injected water with a syringe to cleanse the parts thoroughly, after which he blew them up with air and dried them; thus rendering them durable, and fit for examination at a proper opportunity. Sometimes he made very important discoveries, by examining insects which he had preserved for several years in balsam. Other insects he punctured with a very fine needle; and after squeezing out all their moisture through the holes made in this manner, he filled them with air, by means of very slender glass tubes; then dried them in the shade; and lastly anointed them with oil of spike in which a little rosin had been dissolved; and by which means they, for a long time, retained their proper forms. He was likewise in possession of a singular secret, by which he could preserve the limbs of insects as limber and perspicuous as ever they had been. He used to make a small puncture or incision in the tails of worms; and after having with great caution squeezed out all the humours, as well as great part of the viscera, he injected them with wax in such a manner as to give them the appearance of living creatures in perfect health. He found that the fat of all insects was entirely dissolvable in oil of turpentine; by which means he was enabled plainly to discern the viscera; though, after this dissolution, it was necessary to cleanse and wash them frequently in clean water. In this manner he would frequently have spent whole days in the preparation of a single caterpillar, and cleansing it from its fat, in order to discover the true situation of the insect's heart. He had a singular dexterity in stripping off the skins of caterpillars that were on the point of spinning their cones. This was done by letting them drop by their threads into scalding water, and then suddenly withdrawing them. Thus the epidermis peeled off very easily; and, when this was done, he put them into distilled vinegar and spirit of wine mixed together in equal proportions; which, by giving a due degree of firmness to the parts, gave him an opportunity of separating them with very little trouble from the exuviæ, without any danger to the internal parts. Thus the nymph could be shown to be wrapped up in the caterpillar and the butterfly in the nymph; and there is little doubt that those who look into the works of Swammerdam, will be amply recompensed, whether they consider the unexampled labour or the piety of the author.

M. Lyonet, a late eminent naturalist, usually drowned the insects he designed to examine; by which means he was enabled to preserve both the softness and transparency of the parts. According to him, the insect, if very small, *viz.* one tenth of an inch, or little more, in length, should be dissected on a glass somewhat concave. If it should be suspected that the insect will putrefy by keeping for a few days, spirit of wine diluted with water must be substituted instead of pure water. The insect must be suffered to dry; after which it may be

Microscope be fastened by a piece of soft wax, and again covered with water.—Larger objects should be placed in a trough of thin wood; and for this purpose the bottom of a common chip box will answer very well; only surrounding the edge of it with soft wax, to keep in the water or other fluid employed in preserving the insect. The body is then to be opened; and if the parts are soft like those of a caterpillar, they should be turned back, and fixed to the trough by small pins, which ought to be set by a small pair of nippers. At the same time, the skin being stretched by another pair of finer forceps, the insect must be put into water, and dissected therein, occasionally covering it with spirit of wine. Thus the subject will be preserved in perfection, so that its parts may be gradually unfolded, no other change being perceived than that the soft elastic parts become stiff and opaque, while some others lose their colour.

The following instruments were made use of by M. Lyonet in his dissection of the *Chenille de Saul.* A pair of scissars as small as could be made, with long and fine arms: A pair of forceps, with their ends so nicely adjusted, that they could easily lay hold of a spider's thread, or a grain of sand: Two fine steel needles fixed in wooden handles, about two inches and three quarters in length; which were the most generally useful instruments he employed.

Dr Hooke, who likewise made many microscopic observations, takes notice, that the common ant or pismire is much more troublesome to draw than other insects, as it is extremely difficult to get the body in a quiet natural posture. If its feet be fettered with wax or glue, while the animal remains alive, it so twists its body, that there is no possibility of gaining a proper view of it; and if it be killed before any observation is made, the shape is often spoiled before it can be examined. The bodies of many minute insects, when their life is destroyed, instantly shrivel up; and this is observable even in plants as well as insects, the surface of these small bodies being affected by the least change of air; which is particularly the case with the ant. If this creature, however, be dropped into rectified spirit of wine, it will instantly be killed; and when it is taken out, the spirit of wine evaporates, leaving the animal dry, and in its natural posture, or at least in such a state that it may easily be placed in whatever posture we please.

Parts of Insects. The *wings*, in many insects, are so transparent, that they require no previous preparation: but some of those that are folded up under *elytra* or cases, require a considerable share of dexterity to unfold them; for these wings are naturally endowed with such a spring, that they immediately fold themselves again, unless care be taken to prevent them. The wing of the earwig, when expanded, is of a tolerable size, yet is folded up under a case not one eighth part of its bulk; and the texture of this wing renders it difficult to be unfolded. This is done with the least trouble immediately after the insect is killed. Holding then the creature by the thorax, between the finger and thumb, with a blunt-pointed pin endeavour gently to open it, by spreading it over the fore-finger, and at the same time gradually sliding the thumb over it. When the wing is sufficiently expanded, separate it from the insect by a sharp knife or a pair of scissars. The wing should be pressed for some time between the thumb and finger before it be removed; it should then be placed between two pieces of paper, and again pressed for at least an hour; after which time, as there will be no danger of its folding up any more, it may be put between the talcs, and applied to the microscope. Similar care is requisite in displaying the wings of the notonecta and other water-insects, as well as most kinds of grylli.

The minute *scales* or *feathers*, which cover the wings of moths or butterflies, afford very beautiful objects for the microscope. Those from one part of the wing frequently differ in shape from such as are taken from other parts; and near the thorax, shoulder, and on the fringes of the wings, we generally meet with hair instead of scales. The whole may be brushed off the wing, upon a piece of paper, by means of a camel's-hair pencil; after which the hairs can be separated with the assistance of a common magnifying glass.

It is likewise a matter of considerable difficulty to dissect properly the *proboscis* of insects, such as the gnat, tabanus, &c. and the experiment must be repeated a great number of times before the structure and situation of the parts can be thoroughly investigated, as the observer will frequently discover in one what he could not in another. The *collector of the bee*, which forms a very curious object, ought to be first carefully washed in spirit of turpentine; by which means it will be freed from the unctuous matter adhering to it: when dry, it is again to be washed with a camel's-hair pencil to disengage and bring forward the small hairs which form part of this microscopic beauty. The best method of managing the *stings* of insects, which are in danger of being broken by reason of their hardness, is to soak the case and the rest of the apparatus for some time in spirit of wine or turpentine; then lay them on a piece of paper, and with a blunt knife draw out the sting, holding the sheath with the nail of the finger or any blunt instrument; but great care is necessary to preserve the *feelers*, which when cleaned add much to the beauty of the object. The *beard* of the lepas antifera is to be soaked in clean soft water, frequently brushing it while wet with a camel's-hair pencil: after it is dried, the brushing must be repeated with a dry pencil to disengage and separate the hairs, which are apt to adhere together.

To view to advantage the *fat*, *brains*, and other similar substances, Dr Hooke advises to render the surface smooth, by pressing it between two plates of thin glass, by which means the matter will be rendered much thinner and more transparent: without this precaution, it appears confused, by reason of the parts lying too thick upon one another. For *muscular fibres*, take a piece of the flesh, thin and dry; moisten it with warm water, and after this is evaporated the vessels will appear more plain and distinct; and by repeated macerations they appear still more so. The *exuviæ* of insects afford a pleasing object, and require but little preparation. If bent or curled up, they will become so relaxed by being kept a few hours in a moist atmosphere, that you may easily extend them to their natural positions; or the steam of warm water will answer the purpose very well.

The *eyes* of insects in general form very curious and

and beautiful objects. Those of the libellula and other flies, as well as of the lobster, &c. must first be cleaned from the blood, &c. after which they should be soaked in water for some days: one or two skins are then to be separated from the eye, which would be otherwise too opaque and confused; but some care is requisite in this operation; for if the skin be rendered too thin, it is impossible to form a proper idea of the organization of the part. In some substances, however, the organization is such, that by altering the texture of the part, we destroy the objects which we wish to observe. Of this sort are the nerves, tendons, muscular fibres, many of which are viewed to most advantage when floating in some transparent fluid. Thus very few of the muscular fibres can be discovered when we attempt to view them in the open air, though great numbers may be seen if they be placed in water or oil. By viewing the thread of a ligament in this manner, we find it composed of a vast number of smooth round threads lying close together. Elastic objects should be pulled or stretched out while they are under the microscope, that the texture and nature of those parts, the figure of which is altered by being thus pulled out, may be more fully discovered.

Other objects. To examine *bones* by the microscope, they should first be viewed as opaque objects; but afterwards, by procuring thin slices of them, they may be viewed as transparent. The sections should be cut in all directions, and be well washed and cleaned; and in some cases maceration will be useful, or the bones may be heated red hot in a clear fire, and then taken out; by which means the bony cells will appear more conspicuous. The *pores of the skin* may be examined by cutting off a thin slice off the upper skin with a razor, and then a second from the same place; applying the latter to the microscope. The lizard, guana, &c. have two skins, one very transparent, the other thicker and more opaque; and, separating these two, you obtain very beautiful objects.

To view the *scales of fish* to advantage, they ought to be soaked in water for a few days, and then carefully rubbed to clean them from the skin and dirt which may adhere to them. The scales of the eel are a great curiosity; and the more so, as this creature was not known to have any scales till they were discovered by the microscope. The method of discovering them is this. Take a piece of the skin of an eel from off its side, and spread it while moist on a piece of glass, that it may dry very smooth: when thus dried, the surface will appear all over dimpled or pitted by the scales, which lie under a sort of cuticle or thin skin; which may be raised with the sharp point of a penknife, together with the scales, which will then easily slip out; and thus we may procure as many as we please.

The *leaves* of many *trees*, as well as of some plants, when dissected, form a very agreeable object. In order to dissect them, take a few of the most perfect leaves you can find, and place them in a pan with clean water. Let them remain there three weeks, or a month, without changing the water; then take them up; and if they feel very soft, and almost rotten, they are sufficiently soaked. They must then be laid on a flat board, and holding them by the stalk, draw the edge of a knife over the upper side of the leaf, which will take off most of the skin. Then turn the leaf, and do the same with the under side; and when the skin is taken off on both sides, wash out the pulpy matter, and the fibres will be exhibited in a very beautiful manner. The leaf may be slit into two parts, by splitting the stalk; and the skins peeled from the fibres will also make a good object. This operation is best performed in the autumn: the fibres of the leaves are much stronger at that season, and less liable to be broken.—The internal structure of shells may be observed by grinding them down on a hone: and all ores and minerals should be carefully washed and brushed with a small brush to remove any sordes that may adhere to them.

To view the *circulation of the blood*, we must observe living animals of the most transparent kind.—A small eel is sometimes used for this purpose; in which case it must be cleansed from the slime naturally adhering to it; after which it may be put into a tube filled with water, where it can be viewed in a satisfactory manner. The tail of any other small fish may be viewed in the same manner, or put upon a slip of flat glass, and thus laid before the microscope. By filling the tube with water when an eel is made use of, we prevent in a great measure the sliminess of the animal from soiling the glass.

The particles of the blood form a very curious object, and have been carefully viewed by different philosophers; who, nevertheless, differ from one another very much in their accounts of them. The best method of viewing these is to take a small drop of blood when warm, and spread it as thin as possible upon a flat piece of glass. By diluting it a little with warm water, some of the large globules will be separated from the smaller, and many of them subdivided; or a small drop of blood may be put into a capillary glass-tube, and then placed before the microscope. Mr Baker advises warm milk as proper to be mixed with the blood; but Mr Hewson, who is accounted the most accurate observer, diluted the blood with that fluid which undoubtedly is more natural to it, *viz.* its own serum: by this method he could preserve the small particles entire, and view them distinctly; and thus he found that they were not globular, as had been imagined by other anatomists, but flat. Having shaken a piece of the crassamentum of the blood in serum till the latter became a little coloured, he spread it with a soft hair pencil on a piece of thin glass, which he placed under the microscope, in such a manner as not to be quite horizontal, but rather higher at one end than the other. Thus the serum flows from the higher to the lower part; and, as it flows, some of the particles will be found to swim on their flat sides, and will appear to have a dark spot in the middle; while others will turn over from one side to the other as they roll down the glass. Many cruel experiments have been tried in order to observe the circulation of the blood in living creatures, and an apparatus has been invented for viewing the circulation in the mesentery of a frog; but as this can answer no useful purpose, and will never be put in practice by persons of humanity, we forbear to mention it.

 II. Besides

II. Besides the objects for the microscope already mentioned, there are innumerable others, some hardly visible, and others totally invisible, to the naked eye; and which therefore, in a more peculiar sense, are denominated,

Microscopic animals. They are the animalcules or moving bodies in water, in which certain substances have been infused; and of which there are a great many different kinds. These animalcula are sometimes found in water which we would call *pure*, did not the microscopes discover its minute inhabitants; but not equally in all kinds of water, or even in all parts of the same kind of it. The surfaces of infusions are generally covered with a scum which is easily broken, but acquires thickness by standing. In this scum the greatest number of animalcules are usually found. Sometimes it is necessary to dilute the infusions; but this ought always to be done with water, not only distilled, but viewed through a microscope, lest it should also have animalcules in it, and thus prove a source of deception. It is, however, most proper to observe those minute objects after the water is a little evaporated; the attention being less diverted by a few objects than when they appear in great numbers. One or two of the animalcules may be separated from the rest by placing a small drop of water on the glass near that of the infusion; join them together by making a small connection between them with a pin; and as soon as you perceive that an animalcule has entered the clear drop, cut off the connection again.

Eels in paste are obtained by boiling a little flour and water into the consistence of book-binders paste; then exposing it to the air in an open vessel, and beating it frequently together to keep the surface from growing mouldy or hard. In a few days it will be found peopled with myriads of little animals visible to the naked eye, which are the eels in question. They may be preserved for a whole year by keeping the paste moistened with water; and while this is done, the motion of the animals will keep the surface from growing mouldy. Mr Baker directs a drop or two of vinegar to be put into the paste now and then. When they are applied to the microscope, the paste must be diluted in a piece of water for them to swim in.

Numberless animalcules are observed by the microscope in infusions of pepper. To make an infusion for this purpose, bruise as much common black pepper as will cover the bottom of an open jar, and lay it thereon about half an inch thick: pour as much soft water into the vessel as will rise about an inch above the pepper. Shake the whole well together: after which they must not be stirred, but be left exposed to the air for a few days; in which time a thin pellicle will be formed on the surface, in which innumerable animals are to be observed by the microscope.

The microscopic animals are so different from those of the larger kinds, that scarce any sort of analogy seems to exist between them; and one would almost be tempted to think that they lived in consequence of laws directly opposite to those which preserve ourselves and other visible animals in existence. They have been systematically arranged by O. F. Muller; though it is by no means probable that all the different classes have yet been discovered. Such as have been observed, however, are by this author divided in the following manner.

I. *Such as have no external organs.*

1. Monas: Punctiforma. A mere point.
2. Proteus: Mutabilis. Mutable.
3. Volvox: Sphæricum. Spherical.
4. Enchelis: Cylindracea. Cylindrical.
5. Vibrio: Elongatum. Long.
   * Membranaceous.
6. Cyclidium: Ovale. Oval.
7. Paramecium: Oblongum. Oblong.
8. Kolpoda: Sinuatum. Sinuous.
9. Gonium: Angulatum. With angles.
10. Bursaria. Hollow like a purse.

II. *Those that have external organs.*

* Naked, or not inclosed in a shell.

1. Cercaria: Caudatum. With a tail.
2. Trichoda: Crinitum. Hairy.
3. Kerona: Corniculatum. With horns.
4. Himantopus: Cirratum. Cirrated.
5. Leucophra: Ciliatum undique. Every part ciliated.
6. Vorticella: Ciliatum apice. The apex ciliated.
   * Covered with a shell.
7. Brachionus: Ciliatum apice. The apex ciliated.

I. *Monas.*

This is by our author defined to be "an invisible (to the naked eye), pellucid, simple, punctiform worm;" but of which, small as it is, there are several species.

1. The *monas termo* or *gelatinosa*, is a small jelly-like point, which can be but imperfectly seen by the single microscope, and not at all by the compound one. In a full light they totally disappear, by reason of their transparency. Some infusions are so full of them that scarce the least empty space can be perceived; the water itself appearing composed of innumerable globular points, in which a motion may be perceived somewhat similar to that which is observed when the sun's rays shine on the water; the whole multitude of animals appearing in commotion like a hive of bees. This animal is very common in ditch-water, and in almost all infusions either of animal or vegetable substances.

2. *Monas atomus* or *albida*; white monas with a variable point. This appears like a white point, which thro' a high magnifier apppears somewhat egg-shaped. The smaller end is generally marked with a black point, the situation of which is variable; sometimes it appears on the large end, and sometimes there are two black spots in the middle. This species was found in sea-water, which had been kept through the whole winter, but was not very fetid. No other kind of animalcule was found in it.

3. *Monas punctum* or *nigra*, black monas. This was found in a fetid infusion of pears, and appears in form of a very minute, opaque, and black point, moving with a slow and wavering motion.

4. *Monas ocellus*, transparent like talc, with a point in the middle. This is found in ditches covered with conferva,

ferva, and fometimes with the cyclidium milium; the margin of it is black, with a black point in the middle.

5. *Monas lens* or *hyalina;* of a talcy appearance. This is found in all kinds of water; fometimes even in that which is pure, but always in the fummer-time in ditch-water. It is found alfo in all infufions of animal or vegetable fubftances, whether in frefh or falt water; myriads being contained in a fingle drop. It is found likewife in the filth of the teeth. It is nearly of a round figure; and fo tranfparent, that it is impoffible to difcover the leaft veftige of inteftines. They generally appear in clufters, but fometimes fingly. Contrary to what happens to other animalcules, they appear to cover the edges of the drop when evaporating, and where they inftantly die. A few dark fhades, probably occafioned by the wrinkling of the body, are perceived when the water is nearly evaporated. The motions of this animalcule are generally very quick; and two united together, may fometimes be feen fwimming among the reft; which is thought to be a fingle one generating another by divifion, as is related under the article Animalcule. Thefe and the animalcules of the firft fpecies are fo numerous, that they exceed all calculation even in a very fmall fpace.

6. *Monas mica,* marked with a circle. This is found in the pureft waters, and may be difcovered with the third lens of the fingle microfcope when the magnifying power is increafed. It appears like a fmall lucid point; but can affume an oval or fpherical fhape at pleafure: fometimes the appearance of two kidneys may be perceived in its body, and there is commonly the figure of an ellipfe in it; the fituation of which is moveable, fometimes appearing in the middle and fometimes approaching to either extremity. It feems encompaffed with a beautiful halo, which is thought to be occafioned by the vibration of fine invifible hairs. It has a variety of motions, and often turns round for a long time in the fame place.

7. The *tranquilla,* or egg-fhaped tranfparent monas with a black margin, is found in urine which has been kept for fome time. Urine in this ftate acquires a fcum in which the animalcules refide; but though kept for feveral months, no other fpecies was found in it. A drop of urine is ufually fatal to other animalcules, though this fpecies is to be met with in no other fubftance. It is generally fixed to one point, but has a kind of vacillatory motion. Frequently thefe creatures are furrounded with a halo. Sometimes they are quadrangular, and at other times fpherical; the black margin is not always to be found; and fometimes there is even an appearance of a tail.

8. The *lamellula,* or flat tranfparent monas, is moft ufually found in falt-water; is of a whitifh colour and tranfparent, more than twice as long as it is broad, with a dark margin, having a vacillatory motion, and frequently appearing as double.

9. The *pulvifculus* or *monas* with a green margin. Thefe are generally found in marfhy grounds in the month of March. They appear like fmall fpherical grains of a green colour on the circumference, having fometimes a green bent line paffing through the middle. They appear fometimes in clufters, from three to feven or more in number, having a wavering kind of motion.

10. The *uva,* or tranfparent gregarious mona, is found in a variety of infufions, and is of that kind which multiplies by dividing itfelf. They appear in clufters of four, five, or fometimes many more; the corpufcles being of various fizes, according to the number collected into one group. The fmaller particles, when feparated from the larger, move about with incredible fwiftnefs. A fingle corpufcle feparated from the heap, and put by itfelf into a glafs, foon increafed in fize till it nearly attained the bulk of the parent group. The furface then affumed a wrinkled appearance, and gradually became like the former, feparating again into fmall particles, which likewife increafed in bulk as before.

II. *The Proteus.*

An invifible, very fimple, pellucid worm, of a variable form.

1. The *diffluens,* branching itfelf out in a variety of directions. It is very rare, and only met with in fens; appearing like a grey mucous mafs, filled with a number of black globules, and continually changing its figure, pufhing out branches of different lengths and breadths. The internal globules divide immediately, and pafs into the new formed parts; always following the various changes of the animalcule; which changes feem to proceed entirely from the internal mechanifm of its body, without the aid of any external power.

2. The *tenax,* running out into a fine point. This is a pellucid gelatinous body, ftored with black molecules, and likewife changing its figure, but in a more regular order than the former. It firft extends itfelf in a ftraight line, the lower part terminating in a bright acute point. It appears to have no inteftines; and when the globules are all collected in the upper part, it next draws the pointed end up toward the middle of the body, which affumes a round form. It goes through a number of different fhapes, part of which are defcribed under the article Animalcule. It is found in fome kinds of river-water, and appears confined almoft entirely to one place, only bending fidewife.

III. *Volvox.*

An invifible, very fimple, pellucid, fpherical worm.

1. The *punctum;* of a black colour, with a lucid point. This is a fmall globule, with one hemifphere opaque and black, the other having a cryftalline appearance; and a vehement motion is obferved in the black part. It moves as on an axis, frequently paffing thro' the drop in this manner. Many are often feen joined together in their paffage through the water; fometimes moving as in a little whirlpool, and then feparating. They are found in great numbers on the furface of fetid fea-water.

2. The *granulum* is of a fpherical figure and green colour, the circumference being bright and tranfparent. It is found in marfhy places about the month of June, and moves but flowly. It feems to have a green opaque nucleus.

3. The *globulus,* with the hinder part fomewhat obfcure, fometimes verges a little towards the oval in its fhape, having a flow fluttering kind of motion, but more

more quick when difturbed. The inteftines are but juft vifible. It is found in moft vegetable infufions, and is ten times larger than the mona lens.

4. The *pilula*, fmall and round, with green inteftines. This is found in water where the lemna minor grows, in the month of December, and has a kind of rotatory motion, fometimes flow and at others quick. The inteftines are placed near the middle, apparently edged with yellow. There is a fmall incifion on one of the edges of the fphere, which may poffibly be the mouth of the creature. The whole animal appears encompaffed with an halo.

5. The *grandinella*, with immoveable inteftines, is much fmaller than the laft, and marked with feveral circular lines. The inteftines are immoveable, and no motion is perceived among the interior molecules. Sometimes it moves about in a ftraight line, at others irregularly, and fometimes keeps in the fame fpot, with a tremulous motion.

6. The *focialis*, with cryftalline molecules placed at equal diftances from one another. This is found in water where the chara vulgaris has been kept; and has its molecules difpofed in a fphere, filling up the whole body of the animalcule; but whether they be covered by a common membrane or united by a ftalk (as in the *vorticella focialis* to be afterwards defcribed) is not known. When very much magnified, fome black points may be feen in the cryftalline molecules. Its motion is fometimes rotatory and fometimes not.

7. The *fphericula*, with round molecules, appears to confift of pellucid homogeneous points of different fizes. It moves flowly from right to left and back again, about a quarter of a circle each time.

8. The *lunula*, with lunular molecules, is a fmall roundifh tranfparent body, confifting of an innumerable multitude of homogeneous molecules of the fhape of a crefcent, without any common margin. It moves continually in a twofold manner, *viz.* of the molecules among one another, and the whole mafs turning flowly round. It is found in marfhy places in the beginning of fpring.

9. The *globator*, or fpherical membranaceous volvox, is found in great numbers in the infufions of hemp and tremella, and in ftagnant waters in fpring and fummer; it was firft obferved and depicted by Leewenhoeck, but the defcriptions of it given by authors differ confiderably from each other. The following is that of Mr Baker. "There is no appearance of either head, tail, or fins. It moves in every direction, backwards, forwards, up or down, rolling over and over like a bowl, fpinning horizontally like a top, or gliding along fmoothly without turning itfelf at all; fometimes its motions are very flow, at other times very fwift; and when it pleafes it can turn round as upon an axis very nimble, without moving out of its place. The body is tranfparent, except where the circular fpots are placed, which are probably its young. The furface of the body in fome is as if all dotted over with little points, and in others as if granulated like fhagreen. In general it appears as if fet round with fhort moveable hairs." Another author informs us, that "they are at firft very fmall, but grow fo large that they can be difcerned with the naked eye: they are of a yellowifh green colour, globular figure, and in fubftance membranaceous and tranfparent; and in the midft of this fubftance feveral fmall globes may be perceived. Each of thefe are fmaller animalcula, which have alfo the diaphanous membrane, and contain within themfelves ftill fmaller generations, which may be diftinguifhed by means of very powerful glaffes. The larger globules may be feen to efcape from the parent, and then increafe in fize."

This little animal appears like a tranfparent globule of a greenifh colour, the fœtus being compofed of fmaller greenifh globules. In proportion to its age it becomes whiter and brighter, and moves flowly round its axis; but to the microfcope its furface appears as if granulated, the roundeft molecules fixed in the centre being largeft in thofe that are young. The exterior molecules may be wiped off, leaving the membrane naked. When the young ones are of a proper fize, the membrane opens, and they pafs through the fiffure; after which the mother melts away. Sometimes they change their fpherical figure, and become flat in feveral places. They contain from 8 to between 30 and 40 globules within the membrane.

10. The *morum*, with fpherical green globules in the centre. This is found amongft the lemna in the months of October and December, and has a flow rotatory motion. The globules feldom move, though a flow quivering motion may fometimes be perceived among them in the centre.

11. The *alva*, compofed of green globules not inclofed in any membrane, is found in the month of Auguft in water where the lemma polyrrhiza grows. —It confifts of a congeries of greenifh-coloured globules, apparently of an equal fize, with a bright fpot in the middle; the whole mafs is fometimes of a fpherical form, fometimes oval, without any common membrane: a kind of halo may be perceived round it, and the mafs generally moves from right to left, but fcarce any motion can be perceived among the globules themfelves. Thefe maffes contain from four to fifty globules, of which a folitary one may fometimes be feen. Sometimes alfo two maffes of globules have been perceived joined together.

12. The *vegetans*, terminating in a little bunch of globules. This is found in river-water in the month of November. It confifts of a number of floccofe opaque branches invifible to the naked eye; and at the apex of thefe is a fmall congeries of very minute oval pellucid corpufcles. Muller, who difcovered this, fuppofed it at firft to be a fpecies of microfcopic and river fertularia: but he afterwards found the bunches quitting the branches, and fwimming about in the water with a proper fpontaneous motion; many of the old branches being deferted, and the younger ones furnifhed with them.

IV. *Enchelis*:

A fimple, invifible, cylindric worm.

1. The *viridis*, or green enchelis, has an obtufe tail, the forepart terminating in an acute truncated angle; the inteftines are obfcure and indiftinct. It continually varies its motion, turning from right to left.

2. The *punctifera*, having the fore part obtufe, the hinder part pointed. It is opaque, and of a green colour, with a fmall pellucid fpot in the fore part, in which two black points may be feen; and a kind of double

 double band crosses the middle of the body. The hinder part is pellucid and pointed, with an incision, supposed to be the mouth, at the apex of the fore-part. It is found in marshes.

3. The *deses*, or gelatinous enchelis, is found, though rarely, in an infusion of lemnæ, and moves very slowly. The body is round, of a very dark-green, the fore-part bluntly rounded off, and the hinder part somewhat tapering, but finished with a round end: near the extremities there is a degree of transparency.

4. The *similis*, with moveable intestines, is found in water that has been kept for several months: it is of an egg-shape, and generally moves very quick, either to the right or left. It is supposed to be furnished with hairs, because when moving quickly the margin appears striated. The body is opaque with a pellucid margin, and filled with moveable spherules.

5. The *serotina*, with immoveable intestines, is of an oval figure, partly cylindrical, the fore-part smaller than the hind, with a black margin, full of gray vesicular molecules: it moves very slowly.

6. The *nebulosa*, with visible moveable intestines, is found in the same water with the cyclidium glaucoma, but is much more scarce. The body is egg-shaped, the fore-part narrow, and frequently filled with opaque confused intestines: when moving, it elevates the fore-part of the body. It is about three times as large as the cyclidium glaucoma.

7. The *feminulum* is found in water that has been kept for some days, and moves by ascending and descending altenately. It is of a cylindrical figure, twice as long as broad, the intestines in the fore-part transparent, but opaque in the hinder part. Sometimes it is observed swimming about with the extremities joined together.

8. The *intermedia*, with a blackish margin, is one of the smallest animalcules: it has a transparent body, without any visible intestines. The fore and hind parts are of an equal size, and the edge is of a deeper colour than the rest. Some have a point in the middle, others a line passing through it.

9. The *ovulum*, is transparent, round, and egg-shaped. A very strong magnifier discovers some long foldings on the surface, with a few bright molecules here and there.

10. The *pirum*, with the hinder part transparent, has the fore-part protuberant and filled with molecules. The hinder part is smaller and empty, with moveable molecular intestines. Its motion is rapid, passing backwards and forwards through the diameter of the drop. When at rest, it appears to have a little swelling on the middle of the body.

11. The *tremula* was found in an infusion with the paramæcia aurelia, and many other animalcules. It is among the least of these minute creatures, and is of a cylindrical figure and gelatinous texture. Its extremity appears pointed, and has a tremulous motion, so as to induce a suspicion that the creature has a tail. Two of these creatures may at times be seen to adhere together.

12. The *constricta*, with a stricture in the middle, is found in salt-water, and is of a very small size, having the middle drawn in as if tied with a string. It is of an oval shape.

13. The *elliptica*, with a congeries of green intestines, is found among the green matter on the sides of vessels in which water has been kept for some time. It is of a roundish shape, and transparent; the fore-part obtuse, the hinder part rather sharp, and marked with green spots. They are generated in such numbers, that myriads may sometimes be found in one drop.

14. The *fusus*, with both ends truncated, was found in water called pure, and had a languid motion. The body is round and transparent, with the fore and hind parts somewhat smaller then the rest. In the inside is a long and somewhat winding intestine, with a bright sky-coloured fluid, and some black molecules transversely situated.

15. The *fritillus*, with the fore-part truncated, is found in an infusion of grass and hay, and runs backward and forward through the drop with a wavering motion. It is one of the most transparent animalcules, and has the fore-part obtusely convex.

16. The *caudata*, with a kind of tail, is but seldom met with. The body is grey and transparent, with globular molecules divided from each other, and dispersed thro' the whole; the fore-part is thick and obtuse, the hind part crystalline and small, the end truncated.

17. The *epistomium*, with the fore-part slender and roundish, is among the smaller animalcula; the body cylindrical and bright, the hind part obtuse, the fore-part smaller, and terminating in a globule, with now and then a black line down the middle.

18. The *gemmata* is found in ditch-water where the lemna thrives. It has a cylindrical body, the upper part running out into a transparent neck, with a double series of globules running down the body. It moves slowly, and generally in a straight line.

19. The *retrograda* moves commonly sideways, and sometimes in a retrograde manner. It has a gelatinous transparent body, thicker in the middle than at the ends, without any thing that can be called intestines, except a pellucid globule discoverable near the hinder part.

20. The *festinans*, with obtuse ends, is found in sea-water, and has a quick vacillatory motion from one side to the other. The body is round, with the fore-part transparent. More than half the length of it is without any visible intestines; but the lower end is filled with minute vesicular and transparent globules; a large globular vesicle is also observed in the fore-part.

21. The *farcimen* was found by Joblot in an infusion of blue bottles, moving very slowly in an undulatory manner. The body is cylindrical, about four times as long as broad, truncated at both ends, the intestines opaque, and not to be distinguished from one another. It forms itself into the shape of the letter *S*, by turning the two extremities contrariwise.

22. The *index* is found in water with the lemna minor; the body opaque, of a grey colour, and long conical shape: the lower end is obtuse, one side projecting like a finger from the edge, with two very small projections from the lower end. It has the power of retracting these projections, and making both ends appear obtuse.

23. The *truncus*, with a kind of head, is the largest of this kind of animalcules. The body is grey, long, and mucous; the fore-part globular, the hinder part obtuse; but it can alter its shape considerably. Sometimes there is an appearance of three teeth proceeding from

Microscope from one of the fides. Globules of different fizes may be obferved within the body. The creature rolls flowly about from right to left.

24. The *larva* is long, round, and filled with molecules. The fore-part is obtufe and tranfparent, with a kind of neck or fmall contraction formed near this end: the lower part is pointed; and about the middle of the body are two fmall pointed projections like nipples, one on each fide.

25. The *fpatula*, with the fore-part tranfparent, and of the fhape of a fpatula. It is perfectly cylindrical, cryftalline, and marked with fine longitudinal furrows; having generally two tranfparent globules, one below the middle, the other near the extremity. It moves in a wavering kind of manner, retaining its general form, but moving the fpatula in various ways. Muller informs us, that he faw it once draw the fpatula within the body, and keep it there for two hours.

26. The *pupula*, with the fore-part papillary, is found in dunghill water in November and December: it has a rotatory motion on a longitudinal axis, and moves in an oblique direction through the water. Both ends are obtufe; and the hinder part is marked with a tranfparent circle, or circular aperture.

27. The *pupa*, with a fmall nipple proceeding from the apex, has a very flow motion, and refembles the former, only that it wants the tranfparent circle, and is much larger. It is all opaque but the fore-end, and filled with obfcure points.

V. *Vibrio:*

A very fimple, invifible, round, and rather long worm.

1. The *lineola* is found in moft vegetable infufions in fuch numbers, that it feems to fill up almoft the whole of their fubftance. It is fo fmall, that with the beft magnifiers we can difcern little more than an obfcure tremulous motion among them. It is more flender than the monas terma.

2. The *rugula* is like a bent line; and fometimes draws itfelf up in an undulated fhape, at others moves without bending the body at all.

3. The *bacillus*, equally truncated at both ends, is found in an infufion of hay; but Muller mentions the following remarkable fact, *viz.* that having made two infufions of hay in the fame water, he put the hay whole in the one, but cut it in pieces in the other: he found in the former none of the vibrio bacillus, but many of the monas lens and kolpoda cucullus; in the latter were many of the vibrio, but few of the other.—This is from fix to ten times longer than the monas lens, but much more flender.

4. The *undula*, is a round, gelatinous, little, undulating line. This is the animal which Leewenhoeck fays is lefs than the tail of one of the feminal animalcules. It never appears ftraight; but when at reft it refembles the letter V, and when in motion the letter M. It commonly refts on the top of the water: fometimes it fixes itfelf by one extremity, and whirls round.

5. The *ferpens*, with obtufe windings or flexures, is found in river-water, but feldom. It is flender, and gelatinous, refembling a ferpentine line, with an inteftine down the middle.

6. The *fpirillum* is exceedingly minute, and twifted in the form of a fpiral, which feems to be its natural fhape, as it never untwifts itfelf, but moves forward in a ftraight line, vibrating the hind and fore parts. It was found in 1782 in an infufion of the fonchus arvenfis.

7. The *vermiculus* has a milky appearance, with an obtufe apex, and a languid undulatory motion, like that of the common worm. It is found in marfhy water in November, but feldom. It is thought to be the animal mentioned by Leewenhoeck as found in the dung of the frog and fpawn of the male libellula.

8. The *inteftinum* is found in marfhy waters, and has a flow progreffive motion. It is milk-coloured, with two obtufe ends, and four or five fpherical eggs are perceivable at the hinder extremity.

9. The *bipunctatus* is found in fetid falt-water, and moves flowly; for the moft part in a ftraight line. The body is pellucid, and of a talc-like appearance; both ends are truncated, and in the middle one or two pellucid globules placed lengthwife.

10. The *tripunctatus* is alfo tranfparent and talcy, with both ends tapering. It has three pellucid globules, the middle one of which is largeft, the fpace between them being generally filled with a green matter. It moves in a ftraight line, backwards and forwards.

11. The *paxillifer*, or ftraw-like vibrio, confifts of a tranfparent membrane, with yellow inteftines, and two or three vifible points. They are found in parcels together from feven to forty in number, and ranged in a variety of forms. When at reft, they generally affume a quadrangular figure; and are thought to have fome affinity to the *hair-like animal* defcribed by Mr Baker, and of which an account is given under the article ANIMALCULE, n° 3.

12. The *lunula*, or bow-fhaped vibrio, refembles the moon at its firft quarter; it is of a green colour, and has from feven to ten globules difpofed in a longitudinal direction.

13. The *verminus* is found in great plenty in falt-water kept for fome days till it becomes fetid. It moves quickly, and with an undulatory motion, backwards and forwards. It is a long tranfparent membrane, with the hind part broader than the fore one. Thefe animalcula feem to be joined together in a very fingular manner.

14. The *malleus* is found in great plenty in fpring-water, and is alternately at reft and in motion every moment; in the former cafe refembling the letter T, and in the latter V. It is a white pellucid animalcule, with a globule affixed to the bafe.

15. The *acus* is in the fhape of a fewing needle; the neck round and partly tranfparent, and marked in the middle with a red point; the tail refembling a fine briftle.

16. The *fagitta*, with a fetaceous tail, has a long and flexible body; broadeft about the middle, and filled there alfo with grey molecules; the fore-part being drawn out into a thin and tranfparent neck, and the upper end thick and black. It is found in falt-water, and feems to move by contracting and extending its neck.

17. The *gordius*, with a tail terminated by a fmall tubercle, was found in an infufion made with falt water. Its fore part throughout about one fixth of its length is tranfparent, and furnifhed with an alimentary tube of a fky colour; the lower part being

 ing bright and pointed, and the middle full of ſmall globules.

18. The *ſerpentulus*, ſomewhat pointed at both ends. This is found in the infuſions of vegetables which have been kept for ſome weeks. Its body is of a whitiſh colour, frequently convoluted, and drawn into different figures. The tail is furniſhed with a long row of very minute points.

19. The *coluber* is found in river-water; the tail is extremely ſmall, and bent ſo as to form a conſiderable angle with the body; the mouth, œſophagus, the molecules in the inteſtines, and the twiſtings of them, are eaſily diſcerned.

20. The *anguillula* is divided into four varieties: 1. The vinegar eel; 2. That in paſte; 3. That of freſh water; and, 4. That of ſalt. The two firſt are treated of under the article Animalcule; the third is exceedingly tranſparent, with a few tranſverſe lines upon the body, but without any appearance of inteſtines. Sometimes it has a long row of little globules, and is frequently furniſhed with two ſmall oval ones: the tail terminates in a point. It has been found in the ſediment formed by vegetables on the ſides of veſſels in which water had been kept for a long time. The fourth variety appears, when preſſed between two glaſs plates, to be little more than two cryſtalline ſkins with a kind of inteſtines of a clay colour. The younger ones are furniſhed with pellucid molecules.

21. The *linter*, or ventricoſe oval vibrio, with a ſhort neck, is found among the *lemnæ*, but not very frequently. It is among the larger kinds of animalcules, egg-ſhaped, pellucid, inflated, and ſomewhat depreſſed at top; having a moveable cryſtalline neck, and the belly filled with pellucid molecules.

22. The *utriculus* reſembles a bottle; the belly is full of molecular inteſtines, the neck bright and clear, the top truncated, and ſome have a pellucid point at the bottom of the belly. It has a conſtant and violent vacillatory motion, the neck moving very quickly from ſide to ſide.

23. The *faſciola* is found in water juſt freed from the froſt, and not often in any other fluid. It is pellucid, with inteſtines like points in the middle. There is likewiſe an alimentary canal gradually diminiſhing in ſize. Its motion is very quick.

24. The *colymbus* is larger than many of the other ſpecies of vibrio, and reſembles a bird in ſhape. The neck, which is a little bent, is round, ſhorter than the trunk, of an equal ſize throughout, and of a bright appearance, with the apex obtuſe. The trunk is thick, ſomewhat triangular, full of yellow molecules; the fore part broad, the hinder part acute, the motion ſlow.

25. The *ſtrictus* has a linear body, being a bright membranaceous thread; the hinder part ſomewhat thicker, round, and filled with molecules, excepting at the end, where there is a ſmall empty pellucid ſpace. It can draw in the ſlender filiform part at pleaſure.

26. The *anas*, with both ends attenuated, and the neck longer than the tail, is found in ſalt water; tho' a kind is likewiſe found in freſh water with a neck longer than the other. The trunk of this animalcule is oblong, opaque, and filled with molecules; the fore and hind parts are drawn out into a pellucid talcy membrane, which the creature can retract at pleaſure.

27. The *cygnus* is a very pellucid line, crooked at top, ſwelling in the middle, and ſharp at the end; the middle full of dark coloured molecules and pellucid inteſtines. It is very ſmall, and moves more ſlowly than any of thoſe that move and advance their necks.

28. The *anſer* is found in water where duckweed grows. The trunk is elliptic, round, and without any inequality on the ſides. It is full of molecules: the hind part ſharp and bright; the fore part produced into a bending neck, longer than the body; the apex whole and even, with blue canals paſſing between the marginal edges, occupying the whole length of the neck; and in one of them a violent deſcent of water to the beginning of the trunk is obſervable. It moves the body ſlow, but the neck more briſkly.

29. The *olor* is found in water that has been kept for a long time, and is full of vegetable green matter. The body is elliptical and ventricoſe, the hind part ſomewhat ſharp, and ſometimes filled with darkiſh molecules. The neck is three or four times longer than the body; of an equal ſize throughout, and is moved very quickly; but the motion of the body itſelf is ſlow.

30. The *falx*, with a crooked neck, and obtuſe hinder part, is pellucid and elliptical; the fore part leſſening into a little, round, bright neck, nearly as long as the trunk. The latter is ſomewhat gibbous, and filled with very ſmall molecules; and there are two ſmall bright globules, one within the hind extremity, and the other in the middle of the body. The neck of this animalcule is immoveable; whence it moves ſomething like a ſcythe.

31. The *intermedius* appears to be an intermediate ſpecies betwixt the falx and the faſciola. It ſeems to be a thin membrane conſtantly folded. The whole has a cryſtalline talcy appearance; the middle filled with grey particles of different ſizes. It has all round a diſtinct bright margin.

VI. *Cyclidium.*

A ſimple, inviſible, flat, pellucid, orbicular or oval worm.

1. The *bulla*, or orbicular bright cyclidium. This is found occaſionally in an infuſion of hay. It is very pellucid and white, but the edges ſomewhat darker than the reſt. It moves ſlowly, and in a ſemicircular direction.

2. The *millium* is very pellucid, and ſplendid like cryſtal; and of an elliptical figure, with a line through the whole length of it. The motion is ſwift, interrupted, and fluttering.

3. The *fluitans* is one of the ſmalleſt animalcula; the body ſomewhat of an oval ſhape, with two ſmall blue ſpaces at the ſides.

4. The *glaucoma* has an oval pellucid body, with both ends plain, or an oval membrane with a diſtinct well-defined edge. The inteſtines are ſo tranſparent, that they can ſcarce be diſcerned when it is empty. When full, they are of a green colour, and there are dark globules diſcoverable in the middle. When there is plenty of water this animalcule moves ſwiftly in a circular and diagonal direction; when it moves ſlowly, it ſeems to be taking in water, and the inteſtines are in a violent commotion. It generates by diviſion.

5. The *nigricans* is very ſmall, pellucid, and flat, with a black margin

Microscope

6. The *roſtratium* is oval, ſmooth, and very pellucid, with the fore part running out into an obtuſe point, with which it ſeems to feel and examine the bodies to which it comes. The inteſtines are filled with a blue liquor, the colour of which ſometimes vaniſhes, and then they ſeem to be compoſed of veſicles.

7. The *nucleus* reſembles a grape ſeed, the body being pellucid and depreſſed, the fore part obtuſely convex, and the hind part acute.

8. The *hyalinum* has a tremulous kind of motion; the body oval, flat, and bright, without any viſible inteſtines.

9. The *pediculus* is ſcarce ever ſeen but on the hydra pallida, upon which it runs as if it had feet. It is gelatinous and white; the bottom gibbous over the back; the extremities depreſſed and truncated, with one end ſometimes apparently cloven into two, which may be ſuppoſed the mouth.

10. The *dubium* is of an oval ſhape, with one ſide convex, the other concave; the margin pellucid, and the inner part containing a great number of molecules.

VII. *Paramæcium*.

An inviſible, membranaceous, flat, and pellucid worm.

1. The *aurelia* is membranaceous, pellucid, and four times longer than it is broad; the fore part obtuſe and tranſparent; the hind part filled with molecules. It has ſomewhat the appearance of a gimlet by reaſon of a fold which goes from the middle to the apex, and is of a triangular figure. It moves in a rectilinear and vacillatory manner. It is found in ditches where there is plenty of duckweed, and will live many months in the ſame water without any renewal of the latter.

2. The *chryſalis* is found in ſalt water, and differs very little from the former, only the ends are more obtuſe, and the margins are filled with black globules.

3. The *verſutum* is found in ditches, and has an oblong, green, and gelatinous body, filled with molecules; the lower part thicker than the other; and both ends obtuſe. It propagates by diviſion.

4. The *oviferum* is membranaceous, oval, grey, and pellucid, with many oval corpuſcles diſperſed through the body.

5. The *marginatum* is flat, elliptical, and every where filled with molecules, except in the lower end where there is a pellucid veſicle. It is ſurrounded by a broad double margin, and a bright ſpiral inteſtine is obſervable.

VIII. *Kolpoda*.

An inviſible, pellucid, flat, and crooked worm.

1. The *lamella* is very ſeldom met with. It reſembles a long, narrow, and pellucid membrane, with the hind part obtuſe, narrower, and curved towards the top. It has a vacillatory and very ſingular motion; going upon the ſharp edge, not on the flat ſide as is uſual with microſcopic animals.

2. The *gallinula* is found in fetid ſalt water; and has the apex ſomewhat bent, the belly oval, convex, and ſtriated.

3. The *roſtrum* is found though ſeldom, in water where the lemna grows; and has a ſlow and horizontal motion. The fore part is bent into a kind of hook; the hind part obtuſe, and quite filled with black molecules.

Microſcope

4. The *ochrea* is depreſſed, membranaceous, and flexible; one edge nearly ſtraight; the other ſomewhat bent, filled with obſcure molecules, and a few little bladders diſperſed here and there.

5. The *mucronata* is a dilated bright membrane; the apex an obtuſe point, with a broad marked border running quite round it. It is filled with grey molecules within the margin, and has a truncated appearance.

6. The *triquetra* was found in ſalt water, and appears to conſiſt of two membranes; the upper ſide flattened, the lower convex, with the apex bent into a kind of ſhoulder.

7. The *ſtriata* is likewiſe found in ſalt water, and is very pellucid and white, with the upper part rather bent, and terminating in a point; the lower part obtuſely round: there is a little black pellucid veſicle at the apex; and with a very great magnifying power the body appears covered with long ſtreaks.

8. The *nucleus* is of an oval ſhape, with the vertex pointed, and of a brilliant tranſparency, by which the viſcera are rendered viſible. Theſe conſiſt of a number of round diaphanous veſicles.

9. The *meleagris* has a dilated membrane, with very fine folds, which it varies in a moment. The fore part of the body to the middle is clear and bright; the hind part variouſly folded in tranſverſe and elevated plaits and full of molecules. Beneath the apex are three or four teeth; but in ſome the edge is obtuſely notched, and ſet with ſmaller notches. In the hinder part are 12 or more equal pellucid globules.

10. The *aſſimilis* is found on the ſea-coaſt, and has an elliptic maſs in the middle, but is not folded like the former. The margin of the fore part is notched from the top to the middle; the lower part ſwells out, and contracts again into a ſmall point.

11. The *cucullus* is found in vegetable infuſions, and in fetid hay; moving in all directions, and commonly with great vivacity. It is very pellucid, and has a well defined margin, filled with little bright veſicles differing in ſize, and of no certain number. Its figure is commonly oval, with the top bent into a kind of beak, ſometimes oblong, but moſt commonly obtuſe. It has in the inſide from 8 to 24 bright little veſicles not diſcernible in ſuch as are young. Some have ſuppoſed theſe to be animalcules which this creature has ſwallowed; but Mr Muller is of opinion that they are its offspring. When this creature is near death by reaſon of the evaporation of the water, it protrudes its offspring with violence. From ſome circumſtances it would ſeem probable that this animalcule caſts its ſkin, as is the caſe with ſome inſects.

12. The *cucullulus* is found in an infuſion of the ſonchus arvenſis. It is very pellucid and cryſtalline, with ſeveral globules, and has an oblique inciſion a little below the apex.

13. The *cuculio* is elliptical, flat on the upper ſide, and convex on the under; the fore part is clear, and from the middle to the hinder part is full of ſilver-like globules. It frequently ſtretches out the fore part, and folds it in different poſitions.

14. The

14. The *ren*, or *crassa*, is found in an infusion of hay, commonly about 13 hours after the infusion is made, and has a quick and vacillatory motion. Its body is yellow, thick, and somewhat opaque; curved a little in the middle, so that it resembles a kidney; and full of molecules. When the water in which it swims is about to fail, it takes an oval form, is compressed, and at last bursts.

15. The *pirum* has an uniform and transparent body, without any sensible inequality; and is of a pale colour, with obscure little globules. It propagates by division.

16. The *cuneus* is white, gelatinous, and without any distinct viscera; having a bright striated pellucid pustule on one side of the fore part. The apex has three or four teeth; and it can bend the hinder part into a spiral form.

IX. *Gonium*.

An invisible, simple, smooth, and angular worm.

1. The *pectorale* is found in pure water, and moves alternately towards the right and left. It is quadrangular and pellucid, with 16 spherical molecules of a greenish colour, "set in a quadrangular membrane, like the jewels in the breast-plate of the high-priest, reflecting light on both sides."

2. The *pulvinatum* is found in dunghills; and appears like a little quadrangular membrane, plain on both sides: but with a large magnifier it appears like a bolster formed of three or four cylindric pillows sunk here and there.

3. The *corrugatum* is found in various kinds of infusions; and is somewhat of a square shape, very small, and in some positions appears as streaked.

4. The *rectangulum* differs but little from the former: the angle at the base is a right one; the larger vesicle is transparent, the rest green.

5. The *truncatum* is found chiefly in pure water, and then but seldom. It has a languid motion, and is much larger than the foregoing. The fore part is a straight line, with which the sides form obtuse angles, the ends of the sides being united by a curved line. The internal molecules are of a dark green, and there are two little bright vesicles in the middle.

X. *Bursaria*.

A very simple, hollow, membranaceous worm.

1. The *truncatella* is visible to the naked eye; white, oval, and truncated at the top, where there is a large aperture descending towards the base. Most of them have four or five yellow eggs at the bottom. They move from left to right, and from right to left; ascending to the surface in a straight line, and sometimes rolling about while they descend.

2. The *bullina* is pellucid and crystalline, having splendid globules of different sizes swimming about with it. The under side is convex, the upper hollow, with the fore part forming a kind of lip.

3. The *hirundinella* has two small projecting wings, which give it somewhat of the appearance of a bird; and it moves something like a swallow. It is invisible to the naked eye; but by the microscope appears a pellucid hollow membrane.

4. The *duplella* was found among duckweed, and appears like a crystalline membrane folded up, without any visible intestines except a small congeries of points under one of the folds.

5. The *globina* has a roundish shape, and is hollow; the lower end being furnished with black molecules of different sizes, the fore part with obscure points, the rest entirely empty, and the middle quite transparent. It moves very slowly from right to left.

XI. *Cercaria*.

An invisible transparent worm with a tail.

1. The *gyrinus* greatly resembles the spermatic animalcules. It has a white gelatinous body; the fore part somewhat globular; the hind part round, long, and pointed. Sometimes it appears a little compressed on each side. When swimming it keeps its tail in continual vibration like a tadpole.

2. The *gibba* is found in the infusions of hay and other vegetables; and is small, opaque, gelatinous, white, and without any visible intestines.

3. The *inquieta* is found in salt water, and is remarkable for changing the shape of its body: sometimes it appears spherical, sometimes like a long cylinder, and sometimes oval. It is white and gelatinous, the tail filiform and flexible, the upper part vibrating violently. A pellucid globule may be observed at the base, and two very small black points near the top.

4. The *lemna* varies its form so much, that it might be mistaken for the proteus of Baker, described under the article ANIMALCULE; though in fact it is totally different. The body sometimes appears of an oblong, sometimes of a triangular, and sometimes of a kidney shape. The tail is generally short, thick, and annulated; but sometimes long, flexible, cylindric, and without rings; vibrating, when stretched out, with so much velocity, that it appears double. A small pellucid globule, which Muller supposes to be its mouth, is observable at the apex; and two black points not easily discovered, he thinks, are its eyes. Sometimes it draws the tail entirely into the body. It walks slowly after taking three or four steps, and extends the tail, erecting it perpendicularly, shaking and bending it; in which state it very much resembles a leaf of the lemna.

5. The *turbo*, with a tail like a bristle, is found among duckweed. It is of a talcy appearance, partly oval and partly spherical; and seems to be composed of two globular bodies, the lowermost of which is the smallest, and it has two little black points like eyes on the upper part. The tail is sometimes straight, sometimes turned back on the body.

6. The *poduria* is found in November and December, in marshy places covered with lemna. It is pellucid; and seems to consist of a head, trunk, and tail: the head resembles that of a herring; the trunk is ventricose and full of intestines, of a spiral form and black colour. The tail most commonly appears to be divided into two bristles. The intestines are in a continual motion when the body moves, and by reason of their various shades make it appear very rough. There are likewise some hairs to be perceived. It turns round as upon an axis when it moves.

7. The *viridis* is found in the spring in ditches of standing water; and in some of its states has a considerable resemblance to the last, but has a much greater power of changing its shape. It is naturally cylindrical,

lindrical, the lower end ſharp, and divided into two parts; but ſometimes contracts the head and tail ſo as to aſſume a ſpherical figure.

8. The *ſetifera* is found in ſalt water, but ſeldom. It is ſmall, the body rather opaque, and of a round figure. The upper part is bright, and ſmaller than the reſt: the trunk is more opaque; the tail ſharp, and near it a little row of ſhort hairs. It has a ſlow rotatory motion.

9. The *hirta* was likewiſe found in ſalt water. It is opaque and cylindrical; and when in motion, the body appears to be ſurrounded with rows of ſmall hairs ſeparated from each other.

10. The *crumena* has a ventricoſe, cylindrical, thick, and wrinkled body; the lower part ſmall; the upper part terminating in a ſmall ſtrait neck like that of a pitcher; the tail linear, and terminating in two diverging points.

11. The *catellus* has a moveable head fixed to the body by a point. The abdomen is twice as long as the head, full of inteſtines, and has a tail ſtill narrower, and terminating in two briſtles which it can unite and ſeparate at pleaſure. It moves briſkly, but without going far from its firſt place.

12. The *catelina* was found in a ditch where there was plenty of duckweed. It is larger than the preceding, and has a thicker and more cylindrical body; the lower part truncated, with two ſhort diverging points projecting from the middle.

13. The *lupus* is found in water among duckweed, and is larger than moſt of the genus. The head is larger than the body; the apex turned down into a little hook; the tail is like the body, but narrower, terminating in two very bright ſpines, which it extends in different directions. Sometimes it contracts into one half its common ſize, and again extends itſelf as before.

14. The *vermicularis* is long, cylindrical, fleſhy, and capable of changing its ſhape. It is divided into eight or nine rings or folding plaits; the apex either obtuſe, or notched into two points; the hinder part rather acute, and terminating in two pellucid thorns, between which a ſwelling is ſometimes perceived. It often projects a kind of cloven proboſcis from the inciſion at the apex. It is found in water where there is duckweed.

15. The *forcipata* is found in marſhy places, is cylindrical and wrinkled, with a forked proboſcis which it can thruſt out or pull in.

16. The *pleuronectes* is found in water which has been kept for ſeveral months. It is membranaceous, roundiſh, and white, with two blackiſh points in the fore part, the hinder part being furniſhed with a ſlender ſharp tail. It has orbicular inteſtines of different ſizes in the middle; the larger of them bright. The motion is vacillatory; and in ſwimming it keeps one edge of the lateral membrane upwards, the other folded down.

17. The *tripos* is flat, pellucid, triangular, having each angle of the baſe or fore part bent down into two linear arms, the apex of the triangle prolonged into tail. It is found in ſalt water.

18. The *cyclidium* is frequently found in pure water, and has an oval, ſmooth, membranaceous, pellucid body with a black margin. The tail is concealed under the edge, and comes out from it at every motion, but in ſuch a manner as to project but little from the edge. There is alſo a kind of border to the hinder part.

19. The *tenax* appears like an oval pellucid membrane, ſomething larger than the *monas lens*. The fore edge is thick and truncated; the hinder part acute, and terminating in a ſhort tail. It whirls about in various directions with great velocity.

20. The *diſcus* is a ſmall orbicular animalcule, with a bent tail.

21. The *orbis* is round, and has a tail conſiſting of two long briſtles.

22. The *luna* is likewiſe round, and has the forepart hollowed into the form of a creſcent.

XII. *Leucophra.*

An inviſible, pellucid, and ciliated worm.

1. The *conflictor*, with moveable inteſtines, is perfectly ſpherical and ſemitranſparent, of a yellow colour, the edges dark. It rolls from right to left, but ſeldom removes from the ſpot where it is firſt found. It is filled with a number of the moſt minute molecules, which move as if they were in a violent conflict; and in proportion to the number of theſe little combatants which are accumulated either on one ſide or other, the whole maſs rolls either to the right or left. It then remains for a little time at reſt, and the conflict ceaſes; but it ſoon becomes more violent, and the ſphere moves the contrary way in a ſpiral line. When the water begins to fail, they aſſume an oblong, oval, or cylindric figure; the hinder part of ſome being compreſſed into a triangular ſhape, and the tranſparent part eſcaping as it were from the inteſtines, which continue to move with the ſame violence till the water fails, when the molecules ſhoot into a ſhapeleſs maſs, which alſo ſoon vaniſhes, and the whole aſſumes the appearance of cryſtals of ſal ammoniac.

2. The *mamilla* is of a dark colour, and filled with globular molecules; ſhort hairs are curved inwards; and it occaſionally projects and draws in a little white protuberance. It is pretty common in marſhy water.

3. The *vireſcens* is a large, pear-ſhaped, greeniſh-coloured animalcule, filled with opaque molecules, and covered with ſhort hairs; generally moving in a ſtraight line. It is found in ſalt water.

4. The *viridis* is much ſmaller than the former, and cannot lengthen or ſhorten itſelf as it does. Sometimes it appears contracted in the middle, as if it were to be divided in two.

5. The *burſata* is found in ſalt water, and is ſimilar in many reſpects to the former. It is of a long oval ſhape, bulging in the middle, and filled with green molecules, every where ciliated except at the apex, which is truncated and ſhaped ſomewhat like a purſe; the hairs are ſometimes collected into little faſcicles.

6. The *poſthuma* is globular, and covered as it were with a pellucid net; is found in fetid ſalt water.

7. The *aurea* is yellow, oval; has both ends equally obtuſe; little hairs diſcovered with difficulty; and has in general a vehement rotatory motion.

8. The *pertuſa* is found in ſalt water; and is gelatinous

tinous and ſmall, without any molecules. The fore-part is truncated, the hind-part brought nearly to a point, with a kind of oval hole on one ſide.

9. The *fracta* is long, with ſinuated angles, white, gelatinous, and granulated, changing its form conſiderably.

10. The *dilatata* appears like a gelatinous membrane, with a few grey molecules in the fore-part, and a great number in the hinder part. It is ſometimes dilated into a triangular form with ſinuated ſides; at other times the ſhape is more irregular and oblong.

11. The *ſcintillans* was found in December among the leſſer lemnæ. It is of a green colour, oval, round, and opaque. It is ſuppoſed to be ciliated from its bright twinkling appearance, which probably ariſes from the motion it gives the water.

12. The *veſiculifera* is oval, very pellucid, with a defined dark edge and inſide, containing ſome very bright bladders or veſicles. The middle frequently appears blue, and the veſicles appear as if ſet in a ground of that colour.

13. The *globulifera* was found in a ditch where the lemna minor grew. The body is round, very pellucid, without molecules, but with three little pellucid globules, and every where ſet with ſhort hairs.

14. The *puſtulata* is found in marſhy waters; and is white, gelatinous, and ſomewhat granulated; the lower part truncated as if an oblique ſection were made in an egg near the bottom. It is covered with little erect ſhining hairs, and at the lower extremity a few bright puſtules may be diſcovered.

15. The *turbinata* is found in ſtinking ſalt water; and is round, pellucid, ſomewhat of the ſhape of an acorn, with a pellucid globule at the lower end.

16. The *acuta* is found in ſalt water, and is gelatinous, thick, capable of aſſuming different ſhapes; having the apex bright, and the reſt of the body filled with little ſpherules. Sometimes it draws itſelf up into an orbicular ſhape, at others one edge is ſinuated.

17. The *notata* is oval, round, and has a black point at the edge.

18. The *candida* is found in ſalt water; and is membranaceous, flat, very white, with no viſible inteſtines except two oval bodies not eaſily perceived. The whole edge is ciliated.

19. The *nodulata* is oblong and oval, with a double row of little nodules.

20. The *ſignata* is common in ſalt water in the months of November and December. It is oblong and ſubdepreſſed, with a black margin filled with little molecules, but more particularly diſtinguiſhed by a curved line in the middle ſomewhat in the ſhape of the letter S; one end of which is ſometimes bent into the form of a ſmall ſpiral.

21. The *trigona* is found in marſhes, but not commonly. It is a yellow triangular maſs filled with unequal pellucid veſicles, one of which is much larger than the reſt, and the edge ſurrounded with ſhort fluctuating hairs.

22. The *fluida* is ſomewhat of a kidney ſhape, but ventricoſe.

23. The *fluxa* is reniform and ſinuated.

24. The *armilla* is round and annular.

25. The *cornuta* is of the ſhape of an inverted cone, opaque, and of a green colour. This requires to be obſerved for ſome time before we can aſcertain its characters. The body is compoſed of molecular veſicles; the fore part is wide and truncated, with a little prominent horn or hook on both ſides; the hind part being conical, every where ciliated, and the hairs exceedingly minute; thoſe in the fore part are three times longer than the former, and move in a circular direction. The hinder part is pellucid, and ſometimes terminates in two or three obtuſe pellucid projections. At one time this animalcule will appear reniform and ciliated on the fore part; but at another time the hairs are concealed. It diſſolves into molecular veſicles when the water evaporates.

26. The *heteroclita* appears to the naked eye like a white point; in the microſcope as a cylindrical body, the fore part obtuſely round, the middle rather drawn in; the lower part round, but much ſmaller than the upper part. It appears wholly ciliated through a large magnifier.

XIII. *Trichoda.*
An inviſible, pellucid, hairy worm.

1. The *grandinella* is a very ſmall pellucid globule, with the inteſtines ſcarce viſible, the top of the ſurface furniſhed with ſeveral ſmall briſtles not eaſily diſcoverable, as the creature has a power of extending or drawing them back in an inſtant. It is found in pure water as well as in infuſions of vegetables.

2. The *cometa* is a pellucid globule filled with bright inteſtines, the fore part furniſhed with hairs, the hind part with a pellucid globule.

3. The *granata* reſembles the two former; and has a darkiſh nucleus in the centre, with ſhort hairs on the edge.

4. The *trochus* is ſomewhat of a pear-ſhape, and pellucid; each ſide of the fore part being diſtinguiſhed by a little bunch of hairs.

5. The *gyrinus* is one of the ſmalleſt of this genus, and is found in ſalt water. It is ſmooth and free from hairs, except at the fore part, where there are a few.

6. The *ſol* is ſmall, globular, and cryſtalline; beſet every where with diverging rays longer than the diameter of the body; the inſide full of molecules. The body contracts and dilates, but the creature remains confined to the ſame ſpot. It was found with other animalcules in water which had been kept three weeks.

7. The *ſolaris* is orbicular, bright, and filled with globular inteſtines, frequently having in it a moveable ſubſtance of the ſhape of the letter S. It has hairs ſeldom exceeding 17 in number, ſet round the circumference, each of them nearly equal in length to the diameter of the animalcule.

8. The *bomba* is of a yellow colour, and full of clay-like molecules. It moves with ſuch velocity as to elude the ſight, and appears of various ſhapes, ſometimes ſpherical, ſometimes kidney-ſhaped, &c.

9. The *orbis* is compoſed of veſicular molecules; is of a ſpherical figure, ſmooth, pellucid, and a little notched in the fore part. The notched part is filled with long hairs, but there are none on the reſt of the body.

10. The *urnula* is membranaceous, pellucid, ſomewhat in the form of a water pitcher, with the fore part hairy. It moves but ſlowly.

11. The *diota* is of a clay-colour, and filled with molecules;

Microscope molecules; the upper part cylindrical and truncated, the lower part ſpherical, the upper part of the mouth hairy at the edges.

12. The *horrida* is ſomewhat of a conical ſhape, the fore part rather broad and truncated, the lower part obtuſe, and the whole covered with radiating briſtles.

13. The *urinarium* is egg-ſhaped, with a ſhort hairy beak.

14. The *ſemiluna* is ſmooth, pellucid, and ſhaped like a creſcent.

15. The *trigona* is of a triangular ſhape, a little convex on both ſides, the fore part acute and ciliated, the hind part broader, and having the extremity as it were gnawed off.

16. The *tinea* is round, not very pellucid, narrow in the fore part, and reſembling an inverted club.

17. The *nigra* was found in ſalt water, and has an opaque body; but when at reſt one ſide appears pellucid. When in violent motion, it ſeems entirely black.

18. The *pubes* is found in water where duckweed grows, chiefly in the month of December. It has a bunch above the hind part marked with black ſpots, depreſſed towards the top, a little folded, and ſomewhat convex on the under part. The apex is furniſhed with hairs, but they are ſeldom viſible till the creature is in the agonies of death, when it extends and moves them vehemently, and attempting as it were to draw in the very laſt drop of water.

19. The *floccus* is membranaceous, the fore part rather conical, with three ſmall hairy papillæ projecting from the baſe.

20. The *ſinuata* is found in river water. It is oblong and depreſſed, with one margin hollow and hairy, and the lower end obtuſe. It is of a yellow colour, and the hollow edge ciliated.

21. The *præceps* is pellucid, the fore part formed into a kind of neck; one edge riſing into a protuberance like a hump-back, the other edge convex.

22. The *proteus* is that which Mr Baker diſtinguiſhes by the ſame name, and of which an account is given under the article Animalcule. It is found in the ſlimy matter adhering to the ſides of veſſels in which vegetables have been infuſed, or animal ſubſtances preſerved. That deſcribed by Mr Adams was diſcovered in the ſlime produced from the water where ſmall fiſhes, water-ſnails, &c. had been kept. The body reſembled that of a ſnail, the ſhape being ſomewhat elliptical, but pointed at one end, while from the other proceeded a long, ſlender, and finely proportioned neck, of a ſize ſuitable to the reſt of the animal.

23. The *verſatilis* lives in the ſea, and has ſome reſemblance to the proteus; but the neck is ſhorter, the apex leſs ſpherical, and the hinder part of the trunk acute.

24. The *gibba* is pellucid; the upper part ſwelled out, with numerous molecules, and three large globules on the inſide. The ends rather incline downwards; and when the water begins to fail, a few minute hairs may be diſcovered about the head and at the abdomen; the body then becomes ſtriated longitudinally.

25. The *foeta* ſomewhat reſembles a rolling-pin in ſhape; has both ends obtuſe, and one ſhorter than the other. It can draw in the ends, and ſwell out the ſides, ſo as to appear almoſt ſpherical.

26. The *patens* is found in ſalt water; and is of a long cylindrical ſhape, filled with molecules, the fore-part bright and clear, with a long opening near the top which tapers to a point, and is beſet with hairs. Microſcope

27. The *patula* is ventricoſe, rather inclining to an oval figure, with a ſmall tube at the fore part, the upper part of which is hairy.

28. The *foveata* is oblong and rather broad, with three little horns on the fore part.

29. The *ſtriata* is found in the month of December in river-water. It is a beautiful animalcule, of a fox colour. It is of an oblong ſhape, the lower end ſomewhat larger than the other. It has a ſet of ſtreaks running from one end to the other, and at the abdomen a double row of little eggs lying in a tranſverſe direction.

30. The *uvula* is found in the infuſion of hay and other vegetables. It is ſix times longer than broad, round, flexuous, of an equal ſize, the greater part filled with obſcure molecules; the fore part rather empty, with an alimentary canal and lucid globules near the middle. The margin of the fore part is covered with ſhort hairs.

31. The *aurantia* is of a gold colour, pellucid, and filled with veſicles.

32. The *ignita* is of a fine purple colour, with ſomething of a reddiſh caſt, pellucid, ſplendid, with a number of globules of different ſizes; the fore part ſmall, the hinder part obtuſe, with a very large opening which ſeems to run through the body.

33. The *priſma* is very ſmall, and ſo tranſparent that it cannot eaſily be delineated. It is of a ſingular ſhape; the under part being convex, the upper compreſſed into a kind of keel, and the fore part ſmall.

34. The *forceps* is found about the winter ſolſtice in water covered with lemna. It is of a yellow colour, large, ſomewhat tranſparent, and filled with molecules, with a large opaque globule in the lower part. The fore part is divided into long lobes, one of which is falciform and acute, the other dilated and obliquely truncated. It can open, ſhut, or croſs, thoſe lobes at pleaſure; and by the motion of them it appears to ſuck in the water.

35. The *forfex* is found in river water. It has the fore part formed into a kind of forceps, one of which is twice as long as the other, hooked and ciliated.

36. The *index* is found in ſalt water, and has the under part of the front of the margin hairy; the apex is formed by the fore part projecting like a finger on a direction poſt.

37. The *trichoda* is of a yellow colour, formed of two pellucid membranes ſtriated longitudinally; the lower end obliquely truncated, and the two extremities bent in oppoſite directions.

38. The *navicula* has three corners; the fore part truncated and ciliated, the hind part acute and bent a little upwards. It has a cryſtalline appearance, and a kind of longitudinal keel runs down the middle.

39. The *ſucciſa* is of a flattened oval ſhape, the edge hairy, and hollowed out in ſuch a manner as to form two unequal legs.

40. The *ſulcata* is ovated and ventricoſe, the apex acute, with a furrow at the abdomen, and both ſides of it ciliated.

41. The *anas* is found in pure water; and is ſmooth, five

five times broader than it is long, filled with darkifh molecules. It has a bright neck, under the top of which are a few unequal hairs. It moves but languidly.

42. The *barbata* is round, fomewhat linear, with both ends obtufe; the fore part narrower, forming as it were a kind of neck, under which is a row of fluctuating hairs. The trunk is full of grey molecules.

43. The *farcimen* is long, round, pellucid, and covered with very minute hairs, and has a great number of mucous veficles about the body.

44. The *crinita* is long, round, every where ciliated on the upper part, and the under part likewife hairy as far as the middle.

45. The *angulus* is long, more convex than moft of the genus, divided by a kind of articulation in the middle into two parts equal in breadth, but of different lengths; the apex has fhort waving hair.

46. The *linter* is found in an infufion of old grafs. It is egg-fhaped, oblong, with both extremities raifed fo that the bottom becomes convex, and the upper part depreffed like a boat: it is of different fhapes at different ages, and fometimes has a rotatory motion.

47. The *paxillus* is found in falt water; and is long, full of grey molecules; the fore part truncated and hairy, and rather fmaller than the other.

48. The *vermicularis* is found in river water; and is pellucid in the fore part, with the hind part full of molecules.

49. The *melitæa* is found in falt water, but very rarely. It is oblong, ciliated, with a globular apex, a dilatable neck, and a kind of periftaltic motion perceivable within it.

50. The *fimbriata* is fubovated, the apex hairy, the hinder part obliquely truncated and ferrated.

51. The *camelus* is found but rarely in vegetable infufions, and moves in a languid manner. The fore part is ventricofe; the back divided by an incifion in the middle into two tubercles; the lower part of the belly finuated.

52. The *augur* is oblong, depreffed, pellucid, and filled with molecules: the vertex is truncated, the forepart forming a fmall beak with three feet underneath; beyond which, toward the hinder part, it is furnifhed with briftles.

53. The *pupa* is roundifh, pellucid, and confifts of three parts. The head is broad, and appears to be hooded, the top being furnifhed with very fmall hairs; on the lower part of the head is a tranfparent veficle, and over the breaft from the bafe of the head hangs a production refembling the fheath of the feet in the pupa of the gnat.

54. The *lunaris* is round and cryftalline; the hinder part fmaller than the other. The edge of the back and the part near the tail are bright and clear. It bends itfelf into the form of an arch.

55. The *bilunis* is arched and flattened with an hairy apex, and two little briftles proceeding from the tail.

56. The *rattus* is oblong, with a kind of keel; the fore part hairy, and a very long briftle proceeding from the hinder part.

57. The *tigris* refembles the former, but differs in the form of the tail, which confifts of two briftles, and likewife in having a kind of incifion in the body a little below the apex.

58. The *perillum* is frequently found in marfhes. It is cylindrical, pellucid, mufcular, and capable of being folded up. It appears double; the interior part full of molecules, with an orbicular mufcular appendage, which it can open and fhut, and which forms the mouth. The external part is membranaceous, pellucid, dilated, and marked with tranfverfe ftreaks; and it can protrude or draw in the orbicular membrane at pleafure. Some have four articulations in the tail, others five; and it has two pairs of briftles, one placed at the fecond joint, the other at the laft.

59. The *clavus* has a confiderable refemblance to a common nail; the fore part is round and hairy, the hinder part terminating in a fharp tail.

60. The *cornuta* is membranaceous, elliptical, full of molecules; the fore part lunated, the other round, and terminating in a tail as long as the body.

61. The *gallina* is found in river water. It is of a grey colour, flat, with feven large molecules and globules within it; the front obtufe, fet with hairs; the hinder part terminating in a tail formed of very fine hairs.

62. The *mufculus* is found in the infufions of hay which have been kept for fome months. It is fmooth, egg-fhaped, with a double margin drawn underneath it: the fore part narrow, and furnifhed with fhort hairs which continually play about; having a fmall tail underneath. It moves flowly, and is furnifhed with molecular inteftines.

63. The *delphis* is found in river water. It is fmooth, pellucid, having the fore part dilated into a femicircle, gradually decreafing in breadth towards the tail. The front is hairy, the hairs ftanding as rays from the femicircular edge: one of the edges is fometimes contracted.

64. The *delphinus* is found in hay that has been infufed for fome months. It is pellucid, fmooth, and egg-fhaped; the hinder part terminating in a tail about half the length of the body, dilated at the upper end, truncated, and always bent upwards. It moves fometimes on its belly and fometimes on its fide.

65. The *clava*, or club trichoda, has the fore part thick, but the hinder part narrow; both extremities obtufe, pellucid, and replete with molecules; the hind part bent down towards the middle.

66. The *cuniculus* is oblong, the fore part hairy, the hinder part rather acute, and filled with molecules and black veficles.

67. The *felis* is large and curved, the fore part fmall, the hinder part gradually diminifhing into a tail, the under part befet with hairs longitudinally.

68. The *pifcis* is oblong, the fore part hairy, the hind part terminating in a very flender tail. It is fmooth, pellucid, much longer than broad, and filled with yellow molecules; the fore part obtufe, the hinder part extremely flender and tranfparent, the upper fide convex.

69. The *larus* is long, round, befet with hairs, and has the tail divided into two points.

70. The *longicauda* is cylindrical; the fore part truncated, and befet with hairs; the tail long, furnifhed with two briftles, and having two joints.

71. The *fixa* has the circumference fet with hairs, and a little folitary pedicle projecting from the body.

72. The *inquilinus* is fheathed within a cylindrical

 tranfparent bag, having a little pedicle bent back within the bag.

73. The *ingenita* is fheathed in a depreffed bag, broadeft at the bafe. The animalcule itfelf is funnel-fhaped, with one or more hairs proceeding from each fide of the mouth of the funnel. It can extend or contract itfelf within the bag, fixing its tail to the bafe, without touching the fides. It is found in falt water.

74. The *innata* is fheathed in a cylindrical bag, with a pedicle paffing through and projecting beyond it.

75. The *transfuga* is broad, the fore part hairy, the hinder part full of briftles; one fide finuated, and the other pointed.

76. The *ciliata* is ventricofe, the hinder part covered with hair.

77. The *bulla* is membranaceous, the fides bent inwards; the fore and hind parts both covered with hairs.

78. The *pellionella* is fomewhat thick in the middle, and pellucid, with a few molecules here and there; the fides obtufe, the fore part ciliated with very fine hairs, the hinder part fet with briftles.

79. The *cyllidium* has the hinder extremity filled with globules of various fizes. It vacillates upon the edge, commonly advancing on its flat fide, and continually drawing in water. It then gapes, and opens into a very acute angle, almoft to the middle of the body; but this is done fo inftantaneoufly, that it can fcarce be perceived.

80. The *curfor* is oval, the fore part hairy, and the hinder part alfo furnifhed with fome ftraight and curved hairs in two fafcicles. Its body is flat, and filled with molecules; and in the fore part is an oblong empty fpace, into which we may fometimes fee the water fucked in.

81. The *pulex* is egg-fhaped, with an incifion in the fore part; the front and bafe hairy.

82. The *lynceus* is nearly fquare, with a crooked beak and hairy mouth. It is membranaceous, and appears compreffed, ftretched out into a beak above, under which there is a little bundle of hairs; the lower edge bends in and out, and is furrounded with a few briftles. The inteftines are beautiful, and a fmall bent tube goes from the mouth to them in the middle of the body. There is likewife another tube between the fore and hind edge, filled with blue liquor. The inteftines and other tube are frequently in motion.

83. The *crofa* is orbicular, the fore part notched; one fide furnifhed with hairs, the hinder part with briftles.

84. The *roftrata* is found in water where duckweed has been kept. It is depreffed, capable of changing its fhape, yellow, with long ciliated hairs; it has four feet tapering to a point, one of them longer than the reft. Both feet and hairs are within the margin. The fhape of the body is generally triangular; the apex formed into an obtufe beak, which the creature fometimes draws in fo that it appears quite round.

85. The *lagena* is round, ventricofe, with a long neck, and the lower end fet with briftles.

86. The *charon* was found in falt water. It is oval, and refembles a boat as well in its motion as fhape: the upper part is hollowed, the under part furrowed and convex; the ftern round, with feveral hairs proceeding from it.

87. The *cimex* is about the fize of the lynceus, has an oval body, with a convex back, flat belly, and incifion in the margin of the fore part, the edges of which incifion appear to move. When this animalcule meets with any obftacles in fwimming, it makes ufe of four briftles, which appear on the under fide as feet.

88. The *cicada* differs but little from the cimex. It is oval, with an obfcure margin, the fore part covered with hairs on the under fide, and the hinder parts beardlefs.

XIV. *Kerona.*
An invifible worm with horns.

1. The *raftellum* is found in river water. It has three rows of horns on the back, which occupy almoft the whole of it.

2. The *lyncafter* is fquare, and its difc furnifhed with fhining horns.

3. The *hiftrio* appears an oblong membrane, pellucid, with four or five black points in the fore part, which are continually changing their fituation, thick fet with fmall globules in the middle, among which four larger ones are fometimes perceived, which by Mr Adams are fuppofed to be eggs. In the middle of the hind part are fome longitudinal ftrokes refembling briftles, which, however, do not feem to project beyond the body.

4. The *cypris* is found in water covered with lemna. It is fomewhat of a pear fhape, compreffed, with a broad and blunt fore part; the front furnifhed with hairs or little vibrating points inferted under the edge, fhorter in the hind part, partly extended ftraight, and partly bent down, having a retrograde motion.

5. The *hauftrum* is orbicular, with the horns in the middle, the fore part membranaceous and ciliated, with feveral briftles at the hinder part.

6. The *hauftallum* differs from the preceding only in having the hinder part without any briftles.

7. The *patella* has an univalved fhell, is orbicular, cryftalline; the fore part fomewhat notched; the flefhy body in the middle of the fhell; with horns or hairs of different lengths jutting out beyond the fhell, and acting inftead of feet and oars, fome of which are bent; and the fuperior ones conftitute a double tranfverfe row.

8. The *vannus* is oval and rather flat, with one edge bent, the oppofite one ciliated, the front furnifhed with horns, and the hind part with briftles.

9. The *pullafter* agrees in many refpects with the *trichoda pulex*: the upper part is pellucid, without any black molecules; the front truncated, the whole furface of the head covered with hair, and the fore part finuous.

10. The *mytillus* is a large animalcule; the fore and hind parts rounded, very pellucid and white, dark in the middle, with black inteftines intermixed with a few pellucid veficles; both extremities appearing as if compofed of two thin plates. It has two fmall horns, with which it agitates the water fo as to form a little whirlpool.

11. The *lepus* is egg-fhaped, compreffed, pellucid, and

Microfcope

and crowned with fhort waving hairs; the bafe terminated with briftles.

12. The *filurus* is an oval, fmooth, animalcule, fomewhat crooked and opaque, with a fafcicle of vibrating hair on the fore part: it has a fharp tail furnifhed with unequal rows of moveable hairs, the back being alfo ciliated: the hairs produce a rotatory motion. The figure varies from oval to oblong, and the filaments of the conferva are often entangled in the tail.

13. The *calvitium* is found in the infufion of vegetables. The body is broad and flat, both fides obtufe, filled with black molecules, and there is a black fpot near the hinder part, where there are likewife a few fhort briftles.

14. The *puftulata* is found in falt water. It is oval, convex; one edge of the hinder part finuated, both ends fet with hairs, and fome horns on the fore part.

XV. *Himantopus:*

A pellucid, invifible, and cirrated worm.

1. The *acarus* is lively, conical, ventricofe, full of black molecules, with a bright and tranfparent fore part. The lower part of the apex has rows of long hairs on the under part fet like rays. Four locks of long crooked hair or feet proceed from the belly, and it is continually moving thefe and other hairs in various directions.

2. The *ludio* is a lively diverting animalcule, fmooth, pellucid, full of fmall points, the fore part clubbed and a little bent, the hinder part narrow; the bafe obliquely truncated, and terminating in a tail ftretched out tranfverfely. The top of the head and middle of the back are furnifhed with long and vibrating hairs; three moveable and flexible curls hang down from the fide of the head at a diftance from each other. When the creature is at reft, its tail is curled; but when in motion, it is drawn tight and extended upwards.

3. The *fannio* is found, though feldom, in water where the lemna grows. The cilia are longer than the hairs, and are continually vibrating: it has two moveable curls hanging on the fide of the head.

4. The *volutator* is fhaped like a crefcent, and has fome cryftalline points; the convex part has a row of hairs longeft towards the tail, and underneath are four feet. It is very lively, and often turns round with a fwift circular motion.

5. The *larva* is long and cirrated in the middle; the body is depreffed and long; the hinder parts acute, and generally curved, pellucid, and filled with granular molecules.

6. The *charon* is found in fea-water, but rarely. It is oval, pellucid, and membranous, with longitudinal furrows, and feveral bent diverging rows of hair below the middle, but none on the hinder part.

7. The *corona* is a membranous lamina, very thin, pellucid, cryftalline, and femilunar: the edge of the bafe thick fet with molecular inteftines; the fore part furnifhed with a kind of mane; towards the hind part are three equal curved hairs or fpines.

XVI. *Vorticella:*

A naked worm with rotatory cilia, capable of contracting and extending itfelf.

1. The *viridis* is vifible to the naked eye, appearing like a fmall green point; but the microfcope difcovers it to be nearly cylindrical, a little thicker at the fore part than the other, and obtufe at both ends. It appears to be totally deftitute of limbs, notwithftanding which it keeps the water in continual motion; fo that it probably has fome invifible rotatory inftrument. It moves fometimes circularly, fometimes in a ftraight line.

Microfcope

2. The *fpheroida* appears alfo like a point; but thro' the microfcope as a globular mafs of a dark green colour. It occafions a vehement motion in the water, probably by means of fome fhort hairs with which it is furnifhed.

3. The *cincta* is of an irregular fhape, fometimes affuming an oval figure, and appearing as if girt round with a tranfverfe keel. It is invifible to the naked eye, ciliated on every fide; the hairs all moveable, and longer on one fide than the other.

4. The *lunifera* is found in falt water; has the fore-part obtufe, the bafe broad, and hollowed away like a crefcent, with a fhort protuberance in the middle of the concave part: the fore part is ciliated.

5. The *burfata* is found in falt water, and is ventricofe, crammed with molecules; the fore part truncated, and both fides of it pellucid: there is a prominent papilla in the middle, which when the animalcule is at reft appears notched, the edge of the aperture being ciliated; the hairs are capable of moving in various directions.

6. The *varia* is cylindrical, truncated, opaque, and blackifh coloured; the fore part ciliated.

7. The *fputarium* is found in October, with the leffer lemna, and is one of the moft fingular of the microfcopic animalcules. When viewed fidewife, it is fometimes nearly cylindrical, only tapering a little towards the hinder part, and having a broad pellucid edge. Viewed from the top, it has fometimes a broad face or difc, furnifhed with radiating hairs, the under part contracted into a globular fhape, of a dark green colour, and filled with fmall grains.

8. The *polymorpha* is vifible to the naked eye, and appears like a green point moving with great agility; but when viewed through a microfcope, it affumes fuch a variety of forms, that it is impoffible to defcribe them. The body is granulous; and a feries of pellucid points is fometimes to be obferved.

9. The *multiformis* is found in falt water, and very much refembles the former.

10. The *nigra* is found in Auguft in meadows covered with water. It may be feen with the naked eye, appearing like a black point fwimming on the furface. Through the microfcope it appears as a fmall conical body, obtufe and ventricofe at one end and acute at the other. When the extremities are extended, two fmall white hooks become vifible, by the affiftance of which it moves in the water, and it probably has a rotatory organ: it moves continually in a vacillating manner on the top of the water.

11. The *cucullus* is likewife vifible to the naked eye: it is of a dirty red colour, of a fhape fomewhat conical, and refembling a grenadier's cap.

12. The *utriculata* is green and ventricofe; the belly capable of being lengthened or fhortened; the fore part truncated, much in the fhape of a common water bottle;

bottle; the neck is ſometimes very long, ſometimes very ſhort, and filled with green molecules.

13. The *ocreata* is met with in rivers, though very ſeldom, and in ſhape ſomewhat reſembles the lower part of a boot. The apex of the upper part is truncated and ciliated, the heel pointed, and the foot round.

14. The *valga* is as broad as long, and the apex truncated and ciliated; both angles of the baſe projecting outwards, one ſomewhat like a wart, the other like a finger: It is found in marſhy waters.

15. The *papillaris* is likewiſe found in marſhes where the conferva nitida grows. It is ventricoſe; the fore part truncated, with a papillary tail, and a beautiful papillary excreſcence on the ſide.

16. The *ſacculus* is thick, of an equal diameter every where, and full of molecules. The edge of the mouth is bent back; the hinder part is obtuſe, ſometimes notched and contracted, with cilia to be ſeen on both ſides of the mouth.

17. The *cirrata* is found in ditch-water. It is ventricoſe, the aperture ſinuated, and two tufts of hair on each ſide of the belly.

18. The *naſuta* is inviſible to the naked eye, but the microſcope diſcovers it to be furniſhed with a rotatory organ encompaſſing the middle. It is pellucid, cylindrical, of an unequal ſize; the fore part truncated and ciliated, with a triangular prominence in the middle of the aperture; the hinder part is obtuſe, with a point on each ſide of the middle of the body. When the water is nearly exhaled, two rotatory organs are obſervable; one on the fore part, and the other encompaſſing the middle of the body; the hairs of the latter being in violent motion. Other faſcicles of moving hair are likewiſe to be obſerved; and the quick and various motions of this apparatus are very ſurpriſing.

19. The *ſtellina* is of an orbicular ſhape, with a molecular diſc and ciliated margin.

20. The *diſcina* is likewiſe orbicular, the edge ciliated, with a kind of handle on the under ſide.

21. The *ſcyphina* is bowl-ſhaped, cryſtalline, with an opaque ſpherule in the middle.

22. The *albina* is cylindrical in the fore part, the hinder part tapering, and almoſt ending in a point.

23. The *fritillina* is empty and cylindrical, with a truncated apex.

24. The *truncatella* is of the larger kind of animalcules, with a cryſtalline body, full of black molecules, the ſkin perfectly ſmooth and colourleſs, the hinder extremity rounded, and the anterior part truncated: at this extremity there is a large opening that ſerves for a mouth, which is thickly ciliated.

25. The *limacina* is cylindrical, truncated, and has two pair of cilia.

26. The *fraxinina* is moſtly cylindrical, the hinder part rather tapering, and full of opaque molecules; tranſparent towards the upper end. Within the edge at the top are two ſmall tubercles, from each ſide of which proceeds a pair of ſmall hairs.

27. The *cratægaria* is found in the month of April, both in the mud and on the tail of the monoculus quadricornis. They are generally heaped together in a ſpherical form, and united to one common ſtalk. They are likewiſe often to be found without a pedicle, the body rather contracted, the aperture circular, and ſurrounded with a marked margin. It has two ſmall arms; and with a powerful magnifier a violent rotatory motion may be obſerved. Sometimes an individual will ſeparate from the community, and move in a kind of ſpiral line for a little time, and then go back to the cell.

28. The *hamata* is not ciliated, nor has it any hairs upon it; the body is granulated, the fore part broad and truncated, the hinder part obtuſe, and capable of being contracted or extended.

29. The *crateriformis* is a lively animalcule, pellucid, round, longer than it is broad, approaching ſomewhat to a ſquare figure, with convex ſides: the head is ſituated at the large end, the ſkin ſmooth, and ſome traces of inteſtines may be diſcovered with difficulty. There is a conſiderable opening ſurrounded by hair at the larger end, and the filaments compoſing it are in continual motion. Two of them are ſometimes ſeen joined together, and full of ſmall ſpherules. In this ſtate they draw each other alternately different ways; the ſurface is ſmooth, and the hairs inviſible.

30. The *canaliculata* appears to the naked eye as a number of white points adhering to the ſides of the glaſs. When magnified, the fore part is narrower than the hind one; in the ſide is a kind of inciſion, and the hinder part is notched towards the middle. It excites a continual whirling motion in the water by means of a rotatory organ with which it is furniſhed.

31. The *verſatilis* is a pellucid, gelatinous animalcule, of a greeniſh colour, and furniſhed with ſmall radii about the circumference; ſo that it appears like a very ſmall water hedge-hog.

32. The *ampulla* is contained in a tranſparent bottle-ſhaped bag; the head divided into two lobes. It ſometimes lies at the bottom of the bag, and ſometimes nearly fills the whole of it.

33. The *folliculata* is gelatinous and cylindrical; and when moſt extended, the baſe appears attenuated, and the apex truncated.

34. The *larva* is of a clay colour, the aperture ciliated, with a globular projection at times appearing to proceed from it.

35. The *ſacculata* has the ſhape of an inverted cone, with an aperture in the figure of a creſcent; the lower part of the trunk notched, forming as it were two teeth; the tail biphyllous. Each of theſe is ſurrounded with a looſe bright ſkin, the head being divided from the trunk by a deep inciſion.

36. The *aurita* is cylindrical and ventricoſe, the aperture deſtitute of hairs; both ſides of it are furniſhed with rotatory cilia, and the tail is biphyllous.

37. The *tremula* has ſomething of a conical ſhape; the mouth being divided into parts which are ſet with ſmall ſpines; and a point projects from the tail.

38. The *ſerita* is muſcular, pellucid, folding variouſly; the fore part truncated: round the margin are rows of hairs; but it has alſo ſtiffer hairs or ſpines continually vibrating, with which it draws in all animate and inanimate ſubſtances which it is able to manage.

39. The *lacinulata* is ſhaped like an inverted cone, the aperture lobated, the tail ſmall and furniſhed with two briſtles. When ſwimming, the rotatory organ may be diſcovered. It moves ſwiftly in an oblique direction.

40. The

Microscope

40. The *constricta* is of two kinds; *viz.* of a pale yellow and of a white colour. They move by fixing their tail to the place where they are, and then extending their body as much as possible; fixing the fore part to the place to which they intend to move, then drawing the hinder part to it, and so on. Sometimes they turn round about upon one of the points of their tail; at other times they spring forwards with a jerk. When at rest they open their mouths very wide.

41. The *togata* has a convex body, filled with molecules, and of a dark colour; the hinder part somewhat broader than the forepart; the latter ciliated, and the tail formed of two very thin pellucid spines, which are somewhat curved, and much longer than the body.

42. The *rotatoria* is the *wheel animal* described by Mr Baker; and of which an account is given under the article Animalcule.

43. The *furcata* is commonly found in water, and has a cylindric body with a rotatory organ, consisting of a row of hairs at the apex: the tail is divided into two parts, turning a little inwards. When at rest it joins the segments of the tail, but opens them when in motion.

44. The *catulus* is commonly found in marshy waters. It is a little thick muscular animalcule, folding itself up: equally broad throughout, the body disfigured by longitudinal folds, winding in various directions. The anterior part is connected to the body by a little neck; and it occasionally shows a small rotatory organ. Its motion is rotatory, but in various directions.

45. The *canicula* is cylindrical, the aperture plain, with a short articulated tail divided into two parts.

46. The *felis* has a large body, the apex of an equal thickness, obtuse, with rotatory filaments: the tail is acute, with two pellucid spines in length about one-third part of the body, alternately separating from and approaching one another.

47. The *stentorea*. See the article Polype.

48. The *socialis*, when considerably magnified, appears like a circle surrounded with crowns or ciliated heads, tied by small thin tails to a common centre, from whence they advance towards the circumference, where they turn very briskly, occasioning a kind of whirlpool, which brings its food. When one of them has been in motion for a time, it stops and another begins; sometimes two or three may be perceived in motion at once: they are frequently to be met with separate, with the tail sticking in the mud. The body contracts and dilates very much, so as sometimes to have the appearance of a cudgel, at others to assume almost a globular form.

49. The *flosculosa* appears to the naked eye like a yellow globule adhering to the ceratophyllon like a little flower or a heap of yellow eggs. When magnified, they are seen to consist of a congeries of animalcula constituting a sphere from a mouldy centre. They contract and extend their bodies either alone or in society, and excite a vortex in the water by means of a disc. When they quit the society and act singly, they may be observed to consist of a head, abdomen, and tail; the head being frequently drawn back into the abdomen so far that it cannot be seen, only exhibiting a broad kidney-shaped disc standing out. The abdomen is oblong, oval, and transparent; the tail sharp, twice as long as the abdomen, sometimes rough and annulated, or altogether smooth.

Microscope

50. The *citrina* is found in stagnant water; the head full of molecules, round, every where of an equal size, and very transparent. Both sides of the orifice are ciliated, and each has a rotatory motion appearing sometimes without and sometimes within the edge of the mouth.

51. The *piriformis* is somewhat oval, with a very small retractile foot, which it can draw within itself.

52. The *tuberosa* has a broad upper part, the under part small, with two projections at the anterior end, furnished with a number of fibrillæ, which produce a current of water by their vibration, and thus collect food for the animal.

53. The *ringens* is pear-shaped, pellucid, the middle of the aperture convex, both sides ciliated, the pedicle four times shorter than the body. It can contract the orifice to an obtuse point.

54. The *inclinans* has a pendulous, pellucid, little head; the anterior part truncated, and occasionally contracting itself twice as short as the pedicle. It is shaped like a tobacco-pipe.

55. The *vaginata* is erect, of the shape of a truncated egg; the pedicle is contained in a sheath.

56. The *globularia* is frequent among the cyclopa quadricorni. It has a small spherical head, the aperture of the mouth ciliated, the pedicle four times larger than the body, which it contracts into a spiral form.

57. The *lunaris* has a small goblet-shaped head, the margin of the orifice protuberant, ciliated on both sides, with undulating hairs, and the pedicle eight or ten times the length of the body. The pedicle extends itself as often as the mouth is opened, but is twisted up spirally when it is shut; and this is frequently repeated in a short space.

58. The *convallaria* is the same with the *bell-animal* mentioned by Mr Baker. See the article Animalcule.

59. The *nutans* has a simple pedicle; twists itself spirally; is extremely slender, with a kind of cap on its head; the margin white and round, and seemingly encompassed with a lucid ring; the head diminishing towards the base.

60. The *nebulifera* is narrow at the base; open and truncated at the top; the margin seemingly surrounded with a ring: but, when the aperture is shut, the animalcule is of the shape of an egg, with a simple setaceous pedicle, considerably longer than the body, and commonly much bent back.

61. The *annularis* is visible to the naked eye; the head an inverted cone, convex when the mouth is shut, but truncated when it is open; with a protuberant edge; the pedicle simple, very long, thick, and, whiter at the top than any where else; the apex twisted spirally.—When contracted, it appears to be annulated.

62. The *acinosa* inhabits that whitish substance which often entirely covers plants, wood, shells, &c. When this substance is examined by a microscope, it appears to be wholly composed of living animals of the polype kind. See Polype.

 63. The

Microfcope

63. The *fafciculata* has a rotatory organ, which may fometimes be feen projecting beyond the aperture; there is a little head at the apex, and the pedicle is twifted and very flender. A congealed green mafs which is often found fwimming about in ditches is compofed of myriads of thefe animals, which are not vifible to the naked eye, and when magnified appear like a bundle of green flowers.

64. The *hians* refembles a citron; the apex is truncated, the bafe narrow, and a gaping cleft is obfervable, defcending from the apex to one third of the body.

65. The *bellis* is of a yellow colour, and much refembles the flower of a daify; is ciliated round the margin of the head, and moves in a rotatory manner.

66. The *gemella* has a long pedicle, conftantly furnifhed with two fmall heads.

68. The *pyraria*.
69. The *anaftatica*. } See the article Polype.
70. The *digitalis*

71. The *polypina*, when viewed through a fmall magnifier, they appear like fo many little trees: the upper part, or heads, are egg fhaped, the top truncated, the lower part filled with inteftines; the branches thick fet with little knobs.

72. The *racemofa* is only diftinguifhed from the vorticella focialis by always adhering to the fides of the veffel in which it is placed. By the microfcope, we difcover a long pedicle fticking to the fides of the veffels, from which proceed an innumerable quantity of cryftalline pellucid pearls; which, together with the ftalk, are varioufly agitated in the water. Sometimes they move feparately; fometimes they are drawn down to the root, and in a moment expanded again.

XVII. *Brachionus*:

A contractile worm, covered with a fhell, and furnifhed with rotatory cilia.

1. The *ftriatus* has an oblong, pellucid fhell, capable of altering its figure. The apex is truncated, with fix fmall teeth on the edge of it, twelve longitudinal ftreaks down the back, the bafe obtufe and fmooth. The teeth are occafionally protruded or retracted; and there are two fmall fpines or horns on the other fide of the fhell. The animal itfelf is of a yellow colour, cryftalline, and mufcular; now and then putting out from the apex two or three little bundles of playing hairs, the two lateral ones fhorter than that in the middle: on the under fide we may obferve a forked deglutatory mufcle, and two rigid points when the apex is drawn in. It is found in fea-water.

2. The *fquamula* has an univalve orbicular fhell, a truncated apex, four teeth, fmooth bafe, and no tail.

3. The *pala* is of a yellow colour; univalved, with an oblong excavated fhell; four long teeth at the apex; a fmooth bafe.

4. The *bipalium* is univalved, the fhell oblong and inflected, ten teeth at the apex, the bafe fmooth, and a fpurious tail.

5. The *patina* is extremely bright and fplendid, has a large body, a cryftalline and nearly circular fhell, without either incifion or teeth, only towards the apex it falls in fo as to form a fmooth notch. A double glittering organ, with ciliated edges, projects from the apex; both of them of a conical figure, and ftanding as it were upon a pellucid fubftance, which is divided into two lobes, between which and the rotatory organ there is a filver coloured crenulated membrane. Two fmall claws may likewife be difcovered near the mouth.

Microfcope

6. The *clypeatus* is univalved, the fhell oblong, apex notched, the tail naked, and bafe fmooth.

7. The *lamellaris* is univalved; the fhell extending confiderably beyond the body; the bafe divided into three fmall horns, with two hairs at the end of the tail.

8. The *patella* is found in marfhy water in the winter-time. It is univalve, the fhell oval, plain, cryftalline, with the anterior part terminating in two acute points on both fides, though the intervening fpace is commonly filled up with the head of the animal. By thefe points it faftens itfelf, and whirls about the body erect. The rotatory cilia are perceived with great difficulty.

9. The *bractea* is univalved, the fhell fomewhat orbicular, apex lunated, bafe fmooth, and the tail furnifhed with two fpines.

10. The *plicatilis* is univalved, with an oblong fhell, the apex hairy, and bafe notched.

11. The *ovalis* is bivalved; the fhell flattened, apex notched, a hollow part at the bafe, the tail formed of two tufts of hair.

12. The *tripos* is bivalved, the apex of the fhell beardlefs, three horns at the bafe, and double tail. It fixes itfelf to objects by the filaments of the tail.

13. The *dentatus* is bivalved, with an arched fhell; the apex and bafe are both toothed, and the tail formed of two fpines.

14. The *mucronatus* is bivalved, fomewhat of a fquare form; the bafe and apex pointed; the tail confifting of two fpines.

15. The *uncinatus* is one of the fmalleft bivalved animalcules; the apex and anterior part round, the hinder part ftraight, terminating in a point, furnifhed with a hook on the fore part, a fmall rotatory organ, a long tail compofed of joints, and divided at the end into two briftles. It can open its fhell both at the fore and hind part.

16. The *cirratus* is larger than the preceding; ventricofe, fomewhat tranfparent, the head conical, with a bundle of hairs on both fides; and it has likewife a rotatory organ.

17. The *paffus* has a cylindric fhell, with two long pendulous locks of hair proceeding from the front, the tail confifting of a fingle briftle.

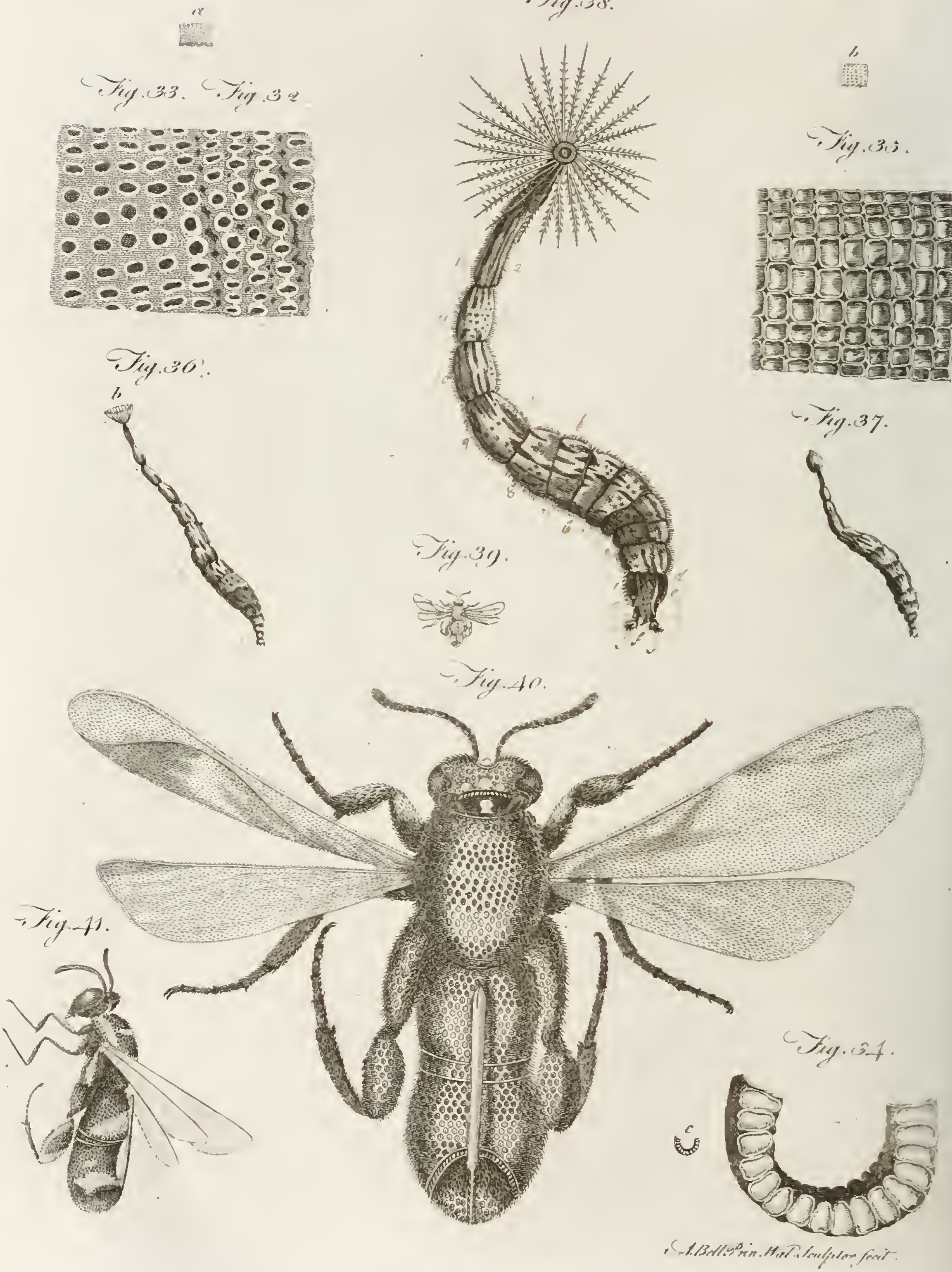
18. The *quadratus* has a quadrangular fhell, with two fmall teeth at the apex, two horns proceeding from the bafe, and no tail.

19. The impreffus has a quadrangular fhell, a fmooth undivided apex; obtufe bafe; notched margin; and flexuous tail.

20. The *urceolaris*. See Polype.

21. The *brachionus Bakeri* has a ventricofe fhell, four teeth at the apex, two horns at the bafe, and a long tail, terminating in two fhort points. The horns are frequently extended; and the circular end of each is furnifhed with a tuft of little hairs, which fometimes move in a vibratory manner, at other times have a rotatory motion. Mr Muller has alfo difcovered in this creature two fmall feelers and a tongue.

22. The *patulus* has a ventricofe fhell, with eight teeth:



A. Bell Prin. Hal. Sculptor fecit.

 teeth at the apex; the baſe lunated, or hollowed into the form of a creſcent, and furniſhed with four horns; the tail ſhort, with two ſmall points at the end.

These are the different kinds of animalcules which have yet been diſcovered. To what is ſaid of them in general under the article Animalcule, we ſhall here add the following obſervations from Mr Adams.—"How many kinds of theſe inviſibles there may be (ſays he) is yet unknown; as they are diſcerned of all ſizes, from thoſe which are barely inviſible to the naked eye, to ſuch as reſiſt the force of the microſcope as the fixed ſtars do that of the teleſcope, and with the greateſt powers hitherto invented appear only as ſo many moving points. The ſmalleſt living creatures our inſtruments can ſhow, are thoſe which inhabit the waters; for though animalcula equally minute may fly in the air, or creep upon the earth, it is ſcarce poſſible to get a view of them; but as water is tranſparent, by confining the creatures within it we can eaſily obſerve them by applying a drop of it to the glaſſes.

"Animalcules in general are obſerved to move in all directions with equal eaſe and rapidity, ſometimes obliquely, ſometimes ſtraight forward; ſometimes moving in a circular direction, or rolling upon one another, running backwards and forwards through the whole extent of the drop, as if diverting themſelves; at other times greedily attacking the little parcels of matter they meet with. Notwithſtanding their extreme minuteneſs, they know how to avoid obſtacles, or to prevent any interference with one another in their motions: ſometimes they will ſuddenly change the direction in which they move, and take an oppoſite one; and, by inclining the glaſs on which the drop of water is, as it can be made to move in any direction, ſo the animalcules appear to move as eaſily againſt the ſtream as with it. When the water begins to evaporate, they flock towards the place where the fluid is, and ſhow a great anxiety and uncommon agitation of the organs with which they draw in the water. Theſe motions grow languid as the water fails, and at laſt ceaſe altogether, without a poſſibility of renewal if they be left dry for a ſhort time. They ſuſtain a great degree of cold as well as inſects, and will periſh in much the ſame degree of heat that deſtroys inſects. Some animalcules are produced in water at the freezing point, and ſome inſects live in ſnow.—By mixing the leaſt drop of urine with the water in which they ſwim, they inſtantly fall into convulſions and die.

"The ſame rule ſeems to hold good in thoſe minute creatures, which is obſervable in the larger animals, *viz.* that the larger kinds are leſs numerous than ſuch as are ſmaller, while the ſmalleſt of all are found in ſuch multitudes, that there ſeem to be myriads for one of the others. They increaſe in ſize, like other animals, from their birth until they have attained their full growth; and when deprived of proper nouriſhment, they in like manner grow thin and periſh."

The modes of propagation among theſe animalcules are various, and the obſervation of them is extremely curious. Some multiply by a tranſverſe diviſion, as is obſerved under the article Animalcule: and it is remarkable, that though in general they avoid one another, it is not uncommon, when one is nearly divided, to ſee another puſh itſelf upon the ſmall neck which joins the two bodies in order to accelerate the ſeparation.—Others, when about to multiply, fix themſelves to the bottom of the water; then becoming firſt oblong, and afterwards round, turn rapidly as on a centre, but perpetually varying the direction of their rotatory motion. In a little time, two lines forming a croſs are perceived; after which the ſpherule divides into four, which grow, and are again divided as before. A third kind multiply by a longitudinal diviſion, which in ſome begins in the fore-part, in others in the hind-part; and from others a ſmall fragment detaches itſelf, which in a ſhort time aſſumes the ſhape of the parent animalcule. Laſtly, others propagate in the ſame manner as the more perfect animals.

In our obſervations under the article Animalcule, we ſuggeſted ſome doubts whether all thoſe minute bodies which go under the name of *animalcules* really do enjoy animal life; or whether they are not in many caſes to be accounted only inanimate and exceedingly minute points of matter actuated by the internal motion of the fluid. This has alſo been the opinion of others: but to all hypotheſes of this kind Mr Adams makes the following reply. "From what has been ſaid, it clearly appears, that their motions are not purely mechanical, but are produced by an internal ſpontaneous principle; and that they muſt therefore be placed among the claſs of living animals, for they poſſeſs the ſtrongeſt marks and the moſt decided characters of animation; and, conſequently, that there is no foundation for the ſuppoſition of a chaotic and neutral kingdom, which can only have derived its origin from a very tranſient and ſuperficial view of theſe animalcules.—It may alſo be further obſerved, that as we ſee that the motions of the limbs, &c. of the larger animals, are produced by the mechanical conſtruction of the body, and the action of the ſoul thereon, and are forced by the ocular demonſtration which ariſes from anatomical diſſection to acknowledge this mechaniſm which is adapted to produce the various motions neceſſary to the animal; and as, when we have recourſe to the microſcope, we find thoſe pieces which had appeared to the naked eye as the primary mechanical cauſes of particular motions, to conſiſt themſelves of leſſer parts, which are the cauſes of motion, extenſion, &c. in the larger; when the ſtructure therefore can be traced no farther by the eye, or by the glaſſes; we have no right to conclude that the parts which are inviſible are not equally the ſubject of mechaniſm: for this would be only to aſſert, in other words, that a thing may exiſt becauſe we ſee and feel it, and have no exiſtence when it is not the object of our ſenſes.—The ſame train of reaſoning may be applied to microſcopic inſects and animalcula: we ſee them move; but becauſe the muſcles and members which occaſion theſe motions are inviſible, ſhall we infer that they have not muſcles, with organs appropriated to the motion of the whole and its parts? To ſay that they exiſt not becauſe we cannot perceive them, would not be a rational concluſion. Our ſenſes are indeed given us that we may comprehend ſome effects; but then we have alſo a mind, with reaſon, beſtowed upon us, that, from the things which we do perceive with our senses, we may deduce the nature of those causes and effects which are imperceptible to the corporeal eye."

Leaving these speculations however, we shall now proceed to give a particular

Explanation of the figures of the various animals, with their parts, ova, &c. represented in the plates.

Plate CCCII. Fig. 32. 33. represent the eggs of the phalæna neustria, as they are taken from the tree to which they adhere, and magnified by the microscope. The strong ground-work visible in many places shows the gum by which they are fastened together; and this connection is strengthened by a very tenacious substance interposed between the eggs, and filling up the vacant spaces. Fig. 34. shows a vertical section of the eggs, exhibiting their oval shape.—Fig. 35. is an horizontal section through the middle of the egg. These eggs make a beautiful appearance through the microscope. The small figures *a*, *b*, *c*, represent the objects in their natural state, without being magnified.

Fig. 36. shows the larva of the *musca chamælcon*, an aquatic insect. When viewed by the naked eye, it appears (as here represented) to be composed of twelve annular divisions, separating it into an head, thorax, and abdomen; but it is not easy to distinguish the two last parts from each other, as the intestines lie equally both in the thorax and abdomen. The tail is furnished with a fine crown or circle of hair *b*, disposed in the form of a ring, and by this means it is supported on the surface of the water, the head and body hanging down towards the bottom, in which posture it will sometimes remain for a considerable time without any motion.—When it has a mind to sink to the bottom, it closes the hairs of the ring, as in fig. 37. Thus an hollow space is formed, including a small bubble of air; by enlarging or diminishing which, it can rise or sink in the water at pleasure. When the bubble escapes, the insect can replace it from the pulmonary tubes, and sometimes considerable quantities of air may be seen to escape from the tail of the worm into the common atmosphere; which operation may easily be observed when the worm is placed in a glass of water, and affords an entertaining spectacle. The snout of this insect is divided into three parts, of which that in the middle is immoveable; the other two, which grow from the sides of the middle one, are moveable, and vibrate like the tongues of lizards or serpents. In these lateral parts lies most of the creature's strength; for it walks upon them when out of the water, appearing to walk on its mouth, and to use it as the parrot does its beak to assist it in climbing.

The larva is shown fig. 38. as it appears through a microscope. It grows narrower towards the head, is largest about that part which we may call the thorax, converges all along the abdomen, and terminates at length in a sharp tail surrounded with hairs, as has already been mentioned. The twelve annular divisions are now extremely visible, and are marked by numbers in the plate. The skin appears somewhat hard, and resembling shagreen, being thick set with grains pretty equally distributed. It has nine holes, or spiracula, probably for the purpose of breathing, on each side; but it has none of these on the tail division *a*, nor any easily visible on the third from the head. In the latter, indeed, it has some very small holes concealed under the skin, near the place where the embryo wings of the future fly are hid. "It is remarkable (says Mr Adams) that caterpillars, in general, have two rings without these spiracula, perhaps because they change into flies with four wings, whereas this worm produces a fly with only two." The skin of the larva is adorned with oblong black furrows, spots of a light colour, and orbicular rings, from which there generally springs a hair; but only those hairs which grow on the insect's sides are represented in the figure. There are also some larger hairs here and there, as at *c c*. The difference of colour, however, in this worm arises only from the quantity of grains in the same space; for where they are in very great numbers, the furrows are darker, and paler where they are less plentiful.

The head *d* is divided into three parts, and covered with a skin which has hardly any discernible grains.—The eyes are rather protuberant, and lie near the snout; on which last are two small horns at *i i*. It is crooked, and ends in a sharp point as at *f*. The legs are placed near the snout between the sinuses in which the eyes are fixed. Each of these legs consists of three joints, the outermost of which is covered with stiff hairs like bristles *g g*. From the next joint there springs a horny bone *h h*, used by the insect as a kind of thumb: the joint is also composed of a black substance of an intermediate hardness between bone and horn; and the third joint is of the same nature. In order to distinguish these parts, those that form the upper sides of the mouth and eyes must be separated by means of a small knife; after which, by the assistance of the microscope, we may perceive that the leg is articulated by some particular ligaments, with the portion of the insect's mouth which answers to the lower jaw in the human frame. We may then also discern the muscles which serve to move the legs, and draw them up into a cavity that lies between the snout and those parts of the mouth which are near the horns *i i*. The insect walks upon these legs, not only in the water, but on the land also. It likewise makes use of them in swimming, keeping its tail on the surface contiguous to the air, and hanging downward with the rest of the body in the water. In this situation, the only perceptible motion it has is in its legs, which it moves in a most elegant manner, from whence it is reasonable to conclude, that the most of this creature's strength lies in its legs, as we have already observed.

The snout of this larva is black and hard: the back part quite solid, and somewhat of a globular form; the front *f* sharp and hollow. Three membranaceous divisions may be perceived on the back part; by means of which, and the muscles contained in the snout, the creature can contract or expand it at pleasure.

The extremity of the tail is surrounded with thirty hairs, and the sides adorned with others that are smaller; and here and there the large hairs branch out into smaller ones, which may be reckoned single hairs. All these have their roots in the outer skin, which in this place is covered with rough grains, as may be observed by cutting it off and holding it against the light upon

Microscope upon a ſlip of glaſs. Thus alſo we find, that at the extremities of the hairs there are grains like thoſe on the ſkin; and in the middle of the tail there is a ſmall opening, within which are minute holes, by which the inſect takes in and lets out the air it breathes. Theſe hairs, however, are ſeldom diſpoſed in ſuch a regular order as is repreſented in fig. 38. unleſs when the inſect floats with the body in the water, and the tail with its hairs a little lower than the ſurface, in which caſe they are diſpoſed exactly in the order delineated in the plate. The leaſt motion of the tail downward produces a concavity in the water; and it then aſſumes the figure of a wine-glaſs, wide at the top and narrow at the bottom. The tail anſwers the double purpoſe of ſwimming and breathing, and through it the inſect receives what is the principle of life and motion to all animals. By means of theſe hairs alſo it can ſtop its motion when ſwimming, and remain ſuſpended quietly without motion for any length of time. Its motions in ſwimming are very beautiful, eſpecially when it advances with its whole body floating on the ſurface of the water after filling itſelf with air by the tail.—To ſet out, it firſt bends the body to the right or left, and then contracts it in the form of the letter S, and again ſtretches it out in a ſtraight line: by thus contracting and then extending the body alternately, it moves on the ſurface of the water. It is very quiet, and is not diſturbed by handling.

Theſe creatures are commonly found in ſhallow ſtanding waters in the beginning of June; but ſome years much more plentifully than others. They crawl on the graſs and other plants which grow in ſuch waters, and are often met with in ditches floating on the ſurface of the water by means of their tail, the head and thorax at the ſame time hanging down; and in this poſture they turn over the clay and dirt with their ſnout and feet in ſearch of food, which is commonly a viſcous matter met with in ſmall ponds and ditches. It is very harmleſs, though its appearance would ſeem to indicate the contrary. It is moſt eaſily killed for diſſection by ſpirit of turpentine.

Fig. 39. ſhows in its natural ſize a beautiful inſect, deſcribed by Linnæus under the name of *Leucopſis dorſigera*, and which appears to be a kind of intermediate genus between a ſphex and a waſp. The antennæ are black and cylindrical, increaſing in thickneſs towards the extremity; the joint neareſt the head is yellow; the head and thorax are black, encompaſſed with a yellow line, and furniſhed with a croſs line of the ſame colour near the head. The ſcutellum is yellow, the abdomen black, with two yellow bands, and a deep ſpot of the ſame colour on each ſide between the bands. A deep poliſhed groove extends down the back from the thorax to the anus, into which the ſting turns and is depoſited, leaving the anus very circular; a yellow line runs on each ſide of the ſting.—The anus and whole body, when viewed with a ſmall magnifier, appear punctuated; but when theſe points are ſeen through a large magnifier, they appear hexagonal. Fig. 40. ſhows the inſect very much magnified. Fig. 41. gives a ſide view of it magnified in a ſmaller degree.

Fig. 42. ſhows an inſect lately diſcovered by Mr John Adams of Edmonton, as he happened to be at an inn. It was firſt ſeen by ſome labouring people who were there at the time, by whom it was conjectured to be a louſe with unuſually long horns, a mite, &c. Mr Adams hearing the debate, procured the inſect; and having viewed it through a microſcope, it preſented the appearance exhibited in fig. 42. The inſect ſeems to be quite diſtinct from the phalangium cancroides of Linnæus. The latter has been deſcribed by ſeveral authors, but none of their deſcriptions agree with this. The abdomen of this inſect is more extended, the claws larger, and much more obtuſe; the body of the other being nearly orbicular, the claws ſlender, and almoſt terminating in a point, more tranſparent, and of a paler colour. Mr Marſham has one in his poſſeſſion not to be diſtinguiſhed from that repreſented in fig. 42, excepting only that it wants the break or dent in the claws, which is ſo conſpicuous in this. He found that inſect firmly fixed by its claws to the thigh of a large fly, which he caught on a flower in Eſſex in the firſt week of Auguſt, and from which he could not diſengage it without great difficulty, and tearing off the leg of the fly. This was done upon a piece of writing paper; and he was ſurpriſed to ſee the little creature ſpring forward a quarter of an inch, and again ſeize the thigh with its claws, ſo that he had great difficulty in diſengaging it. The natural ſize of this creature, which Mr Adams calls the *lobſter-inſect*, is exhibited at *a*. Plate CCCIII.

Fig. 43. ſhows the inſect named by M. de Geer *Phyſapus*, on account of the bladders at its feet, (*Thrips phyſapus*, Lin.). This inſect is to be found in great plenty upon the flowers of dandelion, &c. in the ſpring and ſummer. It has four wings, two upper and two under ones (repreſented fig. 44.) but the two undermoſt are not to be perceived without great difficulty. They are very long; and fixed to the upper part of the breaſt, lying horizontally. Both of them are rather pointed towards the edges, and have a ſtrong nerve running round them, which is ſet with a hair fringe tufted at the extremity. The colour of theſe wings is whitiſh: the body of the inſect is black; the head ſmall, with two large reticular eyes. The antennæ are of an equal ſize throughout, and divided into ſix oval pieces, which are articulated together.—The extremities of the feet are furniſhed with a membranaceous and flexible bladder, which it can throw out or draw in at pleaſure. It preſſes this bladder againſt the ſubſtances on which it walks, and thus ſeems to fix itſelf to them; the bladder ſometimes appears concave towards the bottom, the concavity diminiſhing as it is leſs preſſed. The inſect is repreſented of its natural ſize at *b*.

Fig. 45. repreſents the *Cimex ſtriatus* of Linnæus, remarkable for very bright and elegantly diſpoſed colours, though few in number. The head, proboſcis, and thorax, are black: the thorax ornamented with yellow ſpots; the middle one large, and occupying almoſt one-third of the poſterior part; the other two are on each ſide, and triangular. The ſcutellum has two yellow oblong ſpots, pointed at each end. The ground of the elytra is a bright yellow, ſpotted and ſtriped with black. The nerves are yellow; and there is a brilliant triangular ſpot of orange, which unites the cruſtaceous and membranaceous

ceous parts; the latter are brown, and clouded. It is found on the elm-tree in June. It is repreſented of its natural ſize at *c*.

Fig. 46. ſhows the *Chryſomela aſparagi* of Linnæus, ſo called from the larva of the inſect feeding upon that plant. It is a common inſect, and very beautiful. It is of an oblong figure, with black antennæ, compoſed of many joints, nearly oval. The head is a deep and bright blue; the thorax red and cylindrical: the elytra are blue, with a yellow margin, and having three ſpots of theſame colour on each; one at the baſe, of an oblong form, and two united with the margin: the legs are black; but the under ſide of the belly is of the ſame blue colour with the elytra and head. This little animal, when viewed by the naked eye, ſcarcely appears to deſerve any notice; but when examined by the microſcope, is one of the moſt pleaſing opaque objects we have. It is found in June on the aſparagus after it has run to ſeed; and it is ſhown of its natural ſize at *d*. De Geer ſays that it is very ſcarce in Sweden.

Fig. 47. ſhows an inſect of a ſhape ſo remarkable, that naturaliſts have been at a loſs to determine the genus to which it belongs. In the Fauna Suecica, Linnæus makes it an *attelabus*: but in the laſt edition of the Syſtema Naturæ, it is ranged as a meloe, under the title of the *Meloe monoceros*; though of this alſo there ſeems to be ſome doubt. The true figure of it can only be diſcovered by a very good microſcope. The head is black, and appears to be hid or buried under the thorax, which projects forward like a horn: the antennæ are compoſed of many joints, and are of a dirty yellow colour, as well as the feet: the hinder part of the thorax is reddiſh, the fore-part black.—The elytra are yellow, with a black longitudinal line down the future; there is a band of the ſame colour near the apex, and alſo a black point near the baſe, the whole animal being curiouſly covered with hair. The natural ſize of it is ſhown at *e*. It was found in May. Geoffroy ſays that it lives upon umbelliferous plants.

Fig. 48—53. exhibit the anatomy of the coſſus caterpillar, which lives on the willow. The egg from which it proceeds is attached to the trunk of the tree by a kind of viſcous juice, which ſoon becomes ſo hard that the rain cannot diſſolve it. The egg itſelf is very ſmall and ſpheroidal, and, when examined by the microſcope, appears to have broad waving furrows running through the whole length of it, which are again croſſed by cloſe ſtreaks, giving it the appearance of a wicker baſket. It is not exactly known what time they are hatched; but as the ſmall caterpillars appear in September, it is probable that the eggs are hatched ſome time in Auguſt. When ſmall, they are generally met with under the bark of the tree to which the eggs were affixed; and an aqueous moiſture, oozing from the hole through which they got under the bark, is frequently, though not always, a direction for finding them. Theſe caterpillars change their colour but very little, being nearly the ſame when young as when old. Like many others, they are capable of ſpinning as ſoon as they come from the egg. They alſo change their ſkin ſeveral times; but as it is almoſt impoſſible to rear them under a glaſs, ſo it is very difficult to know exactly how often this moulting takes place.—Mr Adams conjectures that it is more frequently than the generality of caterpillars do, ſome having been obſerved to change more than nine times.

The coſſus generally faſts for ſome days previous to the moulting; during which time the fleſhy and other interior parts of the head are detached from the old ſkull, and retire as it were within the neck. The new coverings ſoon grow on, but are at firſt very ſoft.—When the new ſkin and the other parts are formed, the old ſkin is to be opened, and all the members withdrawn from it; an operation naturally difficult, but which muſt be rendered more ſo from the ſoft and weak ſtate of the creature at that time. It is always much larger after each change.

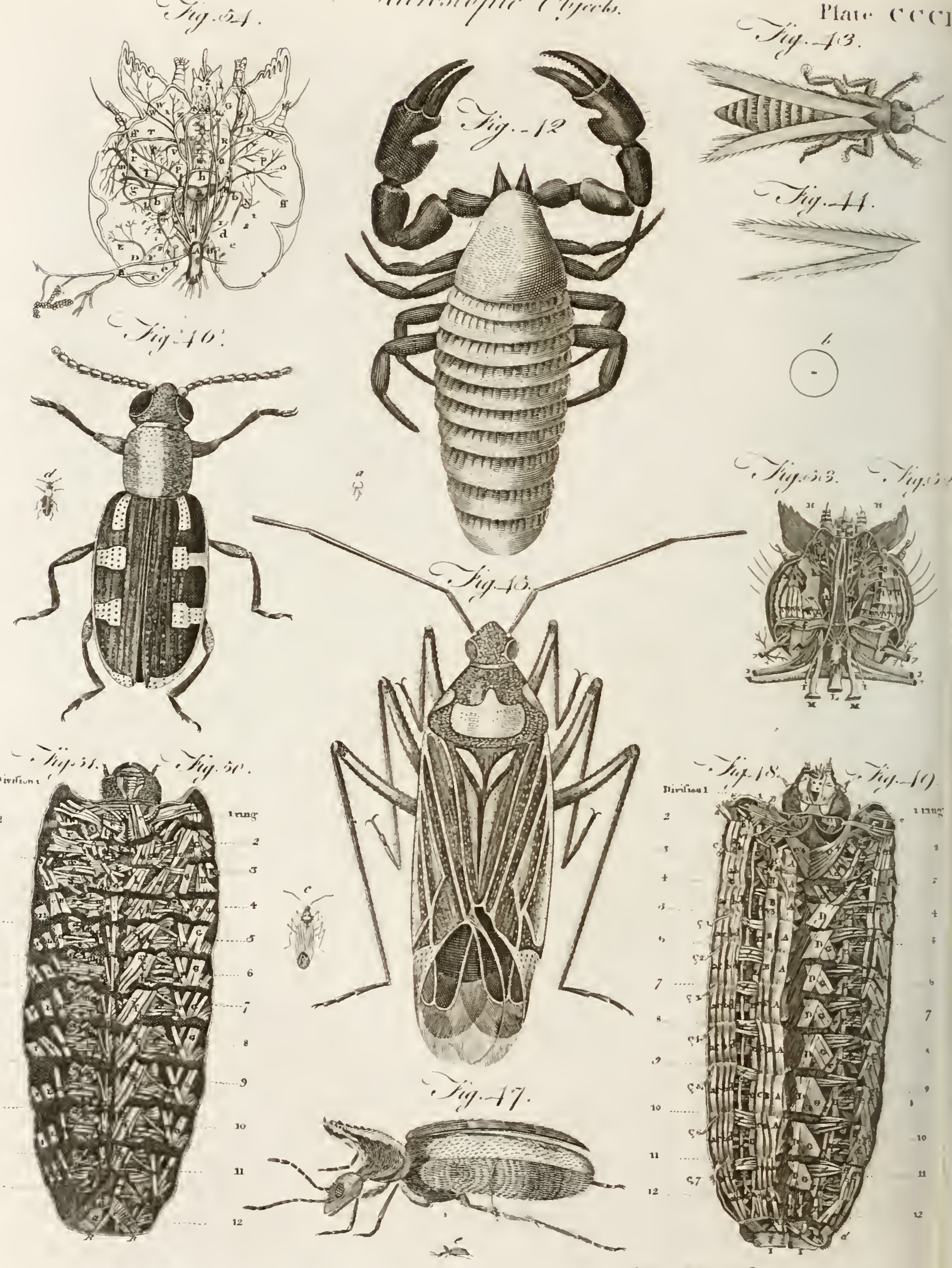
From Mr Lyonet's experiments, it appears, that the coſſus generally paſſes at leaſt two winters, if not three, before it aſſumes the pupa ſtate. At the approach of winter, it forms a little caſe, the inſide of which is lined with ſilk, and the outſide covered with wood ground like very fine ſaw-duſt. During the whole ſeaſon it neither moves nor eats.

This caterpillar, at its firſt appearance, is not above one-twelfth of an inch long; but at laſt attains the length of two, and ſometimes of three inches. In the month of May it prepares for the pupa ſtate; the firſt care being to find a hole in the tree ſufficient to allow the moth to iſſue forth; and if this cannot be found, it makes one equal in ſize to the future pupa. It then begins to form of wood a caſe or cone; uniting the bits, which are very thin, together by ſilk, into the form of an ellipſoid, the outſide being formed of ſmall bits of wood joined together in all directions; taking care, however, that the pointed end of the caſe may always be oppoſite to the mouth of the hole: having finiſhed the outſide of the caſe, it lines the inſide with a ſilken tapeſtry of a cloſe texture in all its parts, except the pointed end, where the texture is looſer, in order to facilitate its eſcape at the proper time. The caterpillar then places itſelf in ſuch a poſture, that the head may always lie towards the opening of the hole in the tree or pointed end of its caſe. Thus it remains at reſt for ſome time: the colour of the ſkin firſt becomes pale, and afterwards brown; the interior parts of the head are detached from the ſkull; the legs withdraw themſelves from the exterior caſe; the body ſhortens; the poſterior part grows ſmall, while the anterior part ſwells ſo much, that the ſkin at laſt burſts; and, by a variety of motions, is puſhed down to the tail; and thus the pupa is exhibited, in which the parts of the future moth may be eaſily traced.—The covering of the pupa, though at firſt ſoft, humid, and white, ſoon dries and hardens, and becomes of a dark purple colour: the poſterior part is moveable; but not the fore-part, which contains the rudiments of the head, legs, and wings. The fore-part of the pupa is furniſhed with two horns, one above and the other under the eyes. It has alſo ſeveral rows of points on its back. It remains for ſome weeks in the caſe; after which the moth begins to agitate itſelf, and the points are then of eſſential ſervice, by acting as a fulcrum, upon which it may reſt in its endeavours to proceed forward, and not ſlip back by its efforts for that purpoſe.

The moth generally continues its endeavours to open the caſe for a quarter of an hour; after which, by redoubled efforts, it enlarges the hole, and preſſes forward

Microscopic Objects.

Plate CCCIII



A. Bell Prin. Wal. Sculptor fecit.

ward until it arrives at the edge, where it makes a full ftop, left by advancing further it fhould fall to the ground. After having in this manner repofed itfelf for fome time, it begins to difengage itfelf entirely; and having refted for fome hours with its head upwards, it becomes fit for action. Mr Marfham fays, that it generally pufhes one third of the cafe out of the hole before it halts.

The body of the caterpillar is divided into twelve rings, marked 1, 2, 3, &c. as reprefented in fig. 48. 49. 50. 51. each of which is diftinguifhed from that which precedes, and that which follows, by a kind of neck or hollow; and, by forming boundaries to the rings, we make twelve other divifions, likewife expreffed in the figures; but to the firft of thefe the word *ring* is affixed, and to the fecond, *divifion*. To facilitate the defcription of this animal, M. Lyonet fuppofed a line to pafs down through the middle of the back, which he called the fuperior line, becaufe it marked the moft elevated part of the back of the caterpillar; and another, paffing from the head down the belly to the tail, he called the inferior line.

All caterpillars have a fmall organ, refembling an elliptic fpot, on the right and left of each ring, excepting the fecond, third, and laft; and by thefe we are furnifhed with a further fubdivifion of this caterpillar, viz. by lines paffing through the fpiracula, the one on the right fide, the other on the left of the caterpillar. Thefe four lines, which divide the caterpillar longitudinally into four equal parts, mark each the place under the fkin which is occupied by a confiderable vifcus. Under the fuperior line lies the heart, or rather thread of hearts; over the inferior line, the fpinal marrow; and the two tracheal arteries follow the courfe of the lateral lines. At equal diftances from the fuperior and two lateral lines, we may fuppofe four intermediate lines. The two between the fuperior and lateral lines are called the intermediate fuperior; the two others oppofite to them, and between the lateral and inferior lines, are called the intermediate inferior.

Fig. 48. 49. fhow the mufcles of the caterpillar, arranged with the moft wonderful fymmetry and order, efpecially when taken off by equal ftrata on both fides, which exhibits an aftonifhing and exact form and correfpondence in them. The figures fhow the mufcles of two different caterpillars opened at the belly, and fuppofed to be joined together at the fuperior lines. The mufcles of the back are marked by capitals; the gaftric mufcles by Roman letters; the lateral ones by Greek characters. Thofe marked θ are called, by M. Lyonet, dividing mufcles, on account of their fituation.

The caterpillar was prepared for diffection by being emptied, and the mufcles, nerves, &c. freed from the fat in the manner formerly directed: after which the following obfervations were made.

The mufcle A in the firft ring is double; the anterior one being thick at top, and being apparently divided into different mufcles on the upper fide, but without any appearance of this kind on the under fide. One infertion is at the fkin of the neck towards the head; the other is a little above; and that of the fecond mufcle A is a little below the firft fpiraculum, near which they are fixed to the fkin.

The mufcle marked α is long and flender, fixed by its anterior extremity under the gaftric mufcles *a* and *b* of the firft ring, to the circumflex fcale of the bafe of the lower lip. It communicates with the mufcle *c* of the fecond ring, after having paffed under fome of the arteries, and introduced itfelf below the mufcle ε.

The mufcle β is fo tender, that it is fcarce poffible to open the belly of the caterpillar without breaking it. It is fometimes double, and fometimes triple.—Anteriorly it is fixed to the pofterior edge of the fide of the parietal fcale, the lower fixture being at the middle of the ring near the inferior line.

There are three mufcles marked ξ; the firft affixed at one extremity near the lower edge of the upper part of the parietal fcale; the other end divides itfelf into three or four tails, fixed to the fkin of the caterpillar under the mufcle δ. The anterior part of the fecond is fixed near the firft; the anterior part of the third a little under the firft and fecond, at the fkin of the neck under the mufcle A. Thefe two laft paffing over the cavity of the firft pair of limbs, are fixed by feveral tails to the edge oppofite to this cavity. In this fubject there are two mufcles marked δ, but fometimes there is only one anteriorly; they are fixed to the lower edge of the parietal fcale, the other ends being inferted in the firft fold of the fkin of the neck on the belly-fide. Fig. 50. beft reprefents the mufcles β and δ; as in that figure they do not appear injured by any unnatural connection.

In the fecond and four following rings we difcern two large dorfal mufcles A and B. In the 7th, 9th, and 10th rings are three, A, B, and C; in the 11th are four, A, B, C, and D; and in the anterior part of the 12th ring are five, A, B, C, D, and E. All thefe ranges of mufcles, however, as well as the gaftric mufcles *a*, *b*, *c*, *d*, appear at firft fight only as a fingle mufcle, running nearly the whole length of the caterpillar; but when this is detached from the animal, it is found to confift of fo many diftinct mufcles, each confifting only of the length of one of the rings, their extremities being fixed to the divifion of each ring, excepting the middle mufcle *a*, which, at the 6th, 7th, 8th, and 9th rings, has its infertions rather beyond the divifion. Each row of mufcles appears as one, becaufe they are clofely connected at top by fome of the fibres which pafs from one ring to the other.

The mufcles A, which are 12 in number, gradually diminifh in breadth to the lower part of the laft ring: at the 8th and three following divifions they communicate with the mufcles B, and at the 11th with D. In the lower part of the laft ring, A is much broader than it was in the preceding ring; one extremity of it is contracted, and communicates with B; the lower infertion being at the membrane I, which is the exterior fkin of the fecal bag. The mufcles A and B, on the lower part of the laft ring, cannot be feen until a large mufcle is removed, which on one fide is fixed to the fubdivifion of the ring and on the other to the fecal bag.

The right mufcles B, which are alfo 12 in number, begin at the fecond ring, and grow larger from thence to the feventh. They are ufually narrower from thence to the 12th; the deficiency in width being

Microfcope ing fupplied by the fix mufcles C, which accompany it from the 7th to the fubdivifion of the 12th ring. The mufcles B and C communicate laterally with the 8th, 11th, and 12th divifions. C is wanting at the fubdivifion of the 12th; its place being here fupplied by B, which becomes broader at this part.

The firft of the three floating mufcles V originates at the firft ring, from whence it introduces itfelf under N, where it is fixed, and then fubdivides, and hides itfelf under other parts. The fecond begins at the fecond divifion, being fixed to the anterior extremity B of the fecond ring; from thence directing itfelf towards the ftomach; and, after communicating with the cafe of the *corpus craffum*, it divides, and fpreads into eight mufcles which run along the belly. The third begins at the third divifion, originating partly at the fkin, and partly at the junction of the mufcles B of the fecond and third ring. It directs itfelf obliquely towards the belly, meeting it near the third fpiraculum; and branching from thence, it forms the oblique mufcles of fome of the vifcera.

The thin, long, mufcle , which is at the fubdivifion of the laft ring, and covers the anterior infertion of the mufcle (*a*) where the ring terminates, is fingle. It begins at one extremity of the mufcle (*c*); at the fore-part of the ring runs along the fubdivifion round the belly of the caterpillar, and finifhes, on the other fide, at the extremity of a fimilar mufcle C.

Fig. 49. fhows the dorfal mufcles of the coffus. To view which in an advantageous manner, we muft ufe the following mode of preparation.

1. All the dorfal mufcles, 35 in number, muft be taken out, as well as the feven lateral ones already defcribed.

2. All the ftraight mufcles of the belly muft be taken away, as well as the mufcular roots (*c*), and the ends of the gaftric mufcles (*c*), which are at the third and fourth divifions.

3. At the fecond divifion the mufcle θ muft be removed; only the extremities being left to fhow where it was inferted.

The parts being thus prepared, we begin at the third ring; where there are found four dorfal mufcles C, D, E, and F. The firft one C, is inferted at the third divifion, under the mufcles . and α, where it communicates by means of fome fibres with the mufcle *f* of the fecond ring; proceeding from thence obliquely towards the intermediate fuperior line, and is fixed at the fourth divifion. As foon as C is retrenched, the mufcle D is feen; which grows wider from the anterior extremity: it lies in a contrary direction to the mufcle C, and is inferted into the third and fourth divifions. The mufcle E lies in the fame direction as the mufcle C, but not fo obliquely: the lower infertion is at the fourth divifion; the other at the third, immediately under C. The mufcle F is nearly parallel to D which joins it; the firft infertion is vifible, but the other is hid under the mufcles E and G at the fourth divifion.

In the eight following rings, there are only two dorfal mufcles; and of thefe D is the only one that is completely feen. It is very large, and diminifhes gradually in breadth from one ring to the other, till it comes to the laft, fending off branches in fome places.—E is one of the ftrait mufcles of the back; and is inferted under the dividing mufcles β, at the divifions of its own ring.

On the anterior part of the 12th ring there are three dorfal mufcles, D, E, and F. D is fimilar to that of the preceding ring, marked alfo D, only that it is no more than half the length; terminating at the fubdivifion of its own ring. E is of the fame length, and differs from the mufcle E of the preceding ring only in its direction. F is parallel to E, and fhorter than it; its anterior end does not reach the twelfth divifion.

On the pofterior part there is only one dorfal mufcle, faftened by fome fhort ones to the fubdivifion of the laft ring, traverfing the mufcles α; and being fixed there as if defigned to ftrengthen them, and to vary their direction.—γ is a fingle mufcle, of which the anterior infertion is vifible, the other end being fixed to the bottom of the foot of the laft leg; its ufe is to move the foot. The anterior part of the mufcle ρ branches into three or four heads, which crofs the fuperior line obliquely, and are fixed to the fkin a little above it. The other end is faftened to the membrane T.

Fig. 50 and 51. fhow the mufcles of the caterpillar when it is opened at the back. The preparation for this view is to difengage the fat and other extraneous matter, as before directed.

The firft ring has only two gaftric mufcles (*c*) and (*d*): the former is broad, and has three or four little tails: the firft fixture is at the bafe of the lower lip, from whence it defcends obliquely, and is fixed between the inferior and lateral line. The fmall mufcle (*d*) is faftened on one fide to the firft fpiraculum; on the other, a little lower, to the intermediate inferior and lateral line; and feems to be an antagonift to the mufcle P, which opens the fpiracula. The pofterior fixture of *g* is under the mufcle C, near the fkin of the neck: *g* is fixed a little on the other fide of C, at the middle of the ring.

In the fecond ring there are three gaftric mufcles, *g*, *h*, and *i*: *g* and *h* are fixed at the folds which terminate the ring; but only the anterior part of *i* is fixed there. The mufcle *h* is triple, and in one of the divifions feparated into two parts; that marked *i* comes nearer the inferior line, and is fixed a little beyond the middle of the ring, where the correfponding mufcle of the oppofite fide is forked to receive it.

In the third ring, the mufcle *h*, which was triple in the foregoing ring, is only double here, that part which is neareft the inferior line being broadeft: it has three tails, of which only two are vifible in the figure. It is exactly fimilar to that of the preceding ring; and is croffed in the fame manner by the mufcle from the oppofite fide of the ring.

Throughout the eight following rings, the mufcle *f* which runs through them all is very broad and ftrong. The anterior part of it is fixed at the intermediate inferior line, on the fold of the firft divifion of the ring: the other part is fixed beyond the lower divifion; with this difference, that at the 10th and 11th rings it is fixed at the laft fold of its ring; whereas, in the others it paffes over that ring, and is inferted into the fkin of the following one. In all thefe,

thefe, the firft extremity of the mufcle *g* is faftened to the fold which feparates the ring from the preceding one, and is parallel to *f*, and placed at the fide of it. The fix firft mufcles marked *g*, are forked; that of the fourth ring being more fo than the reft, nor does it unite till near its anterior infertion. The longeft tail lays hold of the following, and is inferted near the inferior line; the other inferts itfelf near the fame line, at about the middle of its own ring. The two laft do not branch out; but terminate at the divifions, without reaching the following ring. The mufcle *h*, placed at the fide of *f*, has nearly the fame direction, and finifhes at the folds of the ring.

The anterior part of the 12th ring has only one gaftric mufcle, marked *e*: it is placed on the intermediate inferior line; and is inferted at the folds of the upper divifion, and at the fubdivifion of this ring. The lower part has a larger mufcle marked *c*, with feveral divifions; one placed under *b*, with one extremity fixed near the lateral line, at the fubdivifion of its ring; the other to the fecal bag, a little lower than the mufcle *b*.

In fig. 51. all the gaftric mufcles defcribed in fig. 50. difappear, as well as thofe lateral and dorfal ones of which the letters are not to be found in this figure.

In the firft ring are the gaftric mufcles, *e*, *f*, *g*, which are beft feen here: the firft is narrow and long, paffing under and croffing *f*: one of its infertions is at the lower line, the other at the lateral, between the fpiraculum and neck: *f* is fhort, broad, and nearly ftraight, placed along the intermediate line; but between it and the lateral it paffes under *e*, and is fixed to the fold of the fkin which goes from the one bag to the other; the lower infertion is near the fecond divifion. There are fometimes three mufcles of thofe marked *g*, and fometimes four: the lower parts of them are fixed about the middle of the ring, and the anterior parts at the fold of the fkin near the neck. The mufcles *i* and *h* are fixed to the fame fold; the other end of *h* being fixed under the mufcle [11], near the fpiraculum. Above the upper end of *f*, a mufcular body, *g*, may be feen. It is formed by the feparation of two floating mufcles.

The fecond ring has fix gaftric mufcles, *k*, *l*, *m*, *n*, *o*, *p*. The firft is a large oblique mufcle, with three or four divifions placed at the anterior part of the ring: the head is fixed between the inferior line and its intermediate one, at the fold of the fecond divifion; from whence it croffes the inferior line and its correfponding mufcle, terminating to the right and left of the line. I is a narrow mufcle, whofe head is fixed to the fold of the fecond divifion; the tail of it lying under *n*, and faftened to the edge of the fkin that forms the cavity for the leg. The two mufcles marked *m* have the fame obliquity, and are placed the one on the other: the head is inferted in the fkin under the mufcle *k*, and communicates by a number of fibres with the tail of the mufcle *r*; the other end is fixed to the intermediate inferior line at the fold of the third divifion. The large and broad mufcle *n*, covers the lower edge of the cavity of the limb, and the extremity of the tail of *l*. It is fixed firft at the fkin, near the intermediate line, from whence it goes in a perpendicular direction towards *m*, and introduces itfelf under *o* and *m*, where it is fixed. The mufcle *o* is narrow and bent, and covers the edge of the cavity of the leg for a little way; one end terminating there, and the other finifhing at the third divifion near *m*. That marked *p* is alfo bent: it runs near the anterior edge of the cavity of the leg; one end meets the head of *o*, the other end terminates at a raifed fold near the inferior line. There is a triangular mufcle on the fide of the lateral mufcle *o*, fimilar to that marked *g* in the following ring: in this figure it is entirely concealed by the mufcle *m*.

The third ring has no mufcle fimilar to *m*; that marked *k* differs only from that of the fecond ring in being croffed by the oppofite mufcle. Thofe marked *l*, *n*, *o*, *p*, are fimilar to thofe of the preceding one. The mufcle *q* is triangular; the bafe is faftened to the laft fold of the ring; on the lower fide it is fixed to the mufcle *o*, the top to the fkin at the edge of the cavity for the leg.

The eight following rings have the gaftric mufcles, *i*, *k*, *l*, and *m*. The mufcle *i* is quite ftraight, and placed at fome diftance from the inferior line: it is broad at the fourth ring, but diminifhes gradually in breadth to the 11th. In the fourth it is united; but divides into two heads, which divaricate in the following rings. In the fix next rings thefe heads are fixed nearly at the fame place with *a* and *f*; and in the other two it terminates at the fold of the ring. The anterior infertion of the firft and laft is at the fold where the ring begins: that of the fix others is fomewhat lower under the place where the mufcle *i* terminates. The lower part of the oblique mufcle *k* is inferted in the fkin near *i*; the upper part at the intermediate inferior mufcle upon the fold which feparates the following ring, but is wanting in the 11th. The mufcle *l* is large, and co-operates with M: in the opening and fhutting the fpiraculum, one of its fixtures is near the intermediate inferior line, at about the fame height as *i*. The tail terminates a little below the fpiraculum.

The twelfth ring has only the fingle gaftric mufcle *d*, which is a bundle of fix, feven, or eight mufcles: the firft fixture of thefe is at the fubdivifion of the ring near the inferior line: one or two crofs this, and at the fame time the fimilar mufcles of the oppofite fide. Their fixture is at the bottom of the foot; and their office is to affift the mufcle *a* in bringing back the foot, and to loofen the claw from what it lays hold of. One of the infertions of this mufcle *a* is obferved in this figure near *d*, the other near the fubdivifion of the ring.

Fig. 52. and 53. fhow the organization of the head of the coffus, though in a very imperfect manner, as M. Lyonet found it neceffary to employ *twenty* figures to explain it fully. The head is reprefented as it appears when feparated from the fat, and difengaged from the neck. HH are the two palpi. The truncated mufcles D belong to the lower lip, and affift in moving it. K fhows the two ganglions of the neck united. II are the two veffels which affift in fpinning the filk. L, the œfophagus. M, the two diffolving veffels. The Hebrew characters דכבא fhow the continuation of the four cephalic arteries. In fig. 52. the ten abductor mufcles of the jaw

 are

are represented by SS, TT, VV, and Z. Four occipital muscles are seen in fig. 53. under *e e* and *f f*. At *a k* is represented a nerve of the first pair belonging to the ganglion of the neck; *b* is a branch of this nerve.

Fig. 54. exhibits the nerves as seen from the under part; but excepting in two or three nerves, which may be easily distinguished, only one of each pair is drawn, in order to avoid confusion. The nerves of the first ganglion of the neck are marked by capital letters, those of the ganglion (a) of the head by Roman letters; the nerves of the small ganglion by Greek characters. Those of the frontal ganglion, except one, by numbers.

The muscles of the cossus have neither the colour nor form of those of larger animals. In their natural state they are soft, and of the consistence of a jelly. Their colour is a greyish blue, which, with the silver-coloured appearance of the pulmonary vessels, form a glorious spectacle. After the caterpillar has been soaked for some time in spirit of wine, they lose their elasticity and transparency, becoming firm, opaque, and white, and the air-vessels totally disappear. The number of muscles in a caterpillar is very great. The greatest part of the head is composed of them, and there is a vast number about the œsophagus, intestines, &c. the skin is, as it were, lined by different beds of them, placed the one under the other, and ranged with great symmetry. M. Lyonet has been able to distinguish 228 in the head, 1647 in the body, and 2066 in the intestinal tube, making in all 4041.

At first sight the muscles might be taken for tendons, as being of the same colour, and having nearly the same lustre. They are generally flat, and of an equal size throughout; the middle seldom differing either in colour or size from either of the extremities. If they are separated, however, by means of very fine needles, in a drop of some fluid, we find them composed not only of fibres, membranes, and air-vessels, but likewise of nerves; and, from the drops of oil that may be seen floating on the fluid, they appear also to be furnished with many unctuous particles. Their ends are fixed to the skin, but the rest of the muscle is generally free and floating. Several of them branch out considerably; and the branches sometimes extend so far, that it is not easy to discover whether they are distinct and separate muscles or parts of another. They are moderately strong; and those which have been soaked in spirit of wine, when examined by the microscope, are found to be covered with a membrane which may be separated from them; and they appear then to consist of several parallel bands lying longitudinally along the muscle, which, when divided by means of fine needles, appear to be composed of still smaller bundles of fibres lying in the same direction; which, when examined by a powerful magnifier, and in a favourable light, appear twisted like a small cord. The muscular fibres of the spider, which are much larger than those of the caterpillar, consist of two different substances, one soft and the other hard; the latter being twisted round the former spirally, and thus giving it the twisted appearance just mentioned.

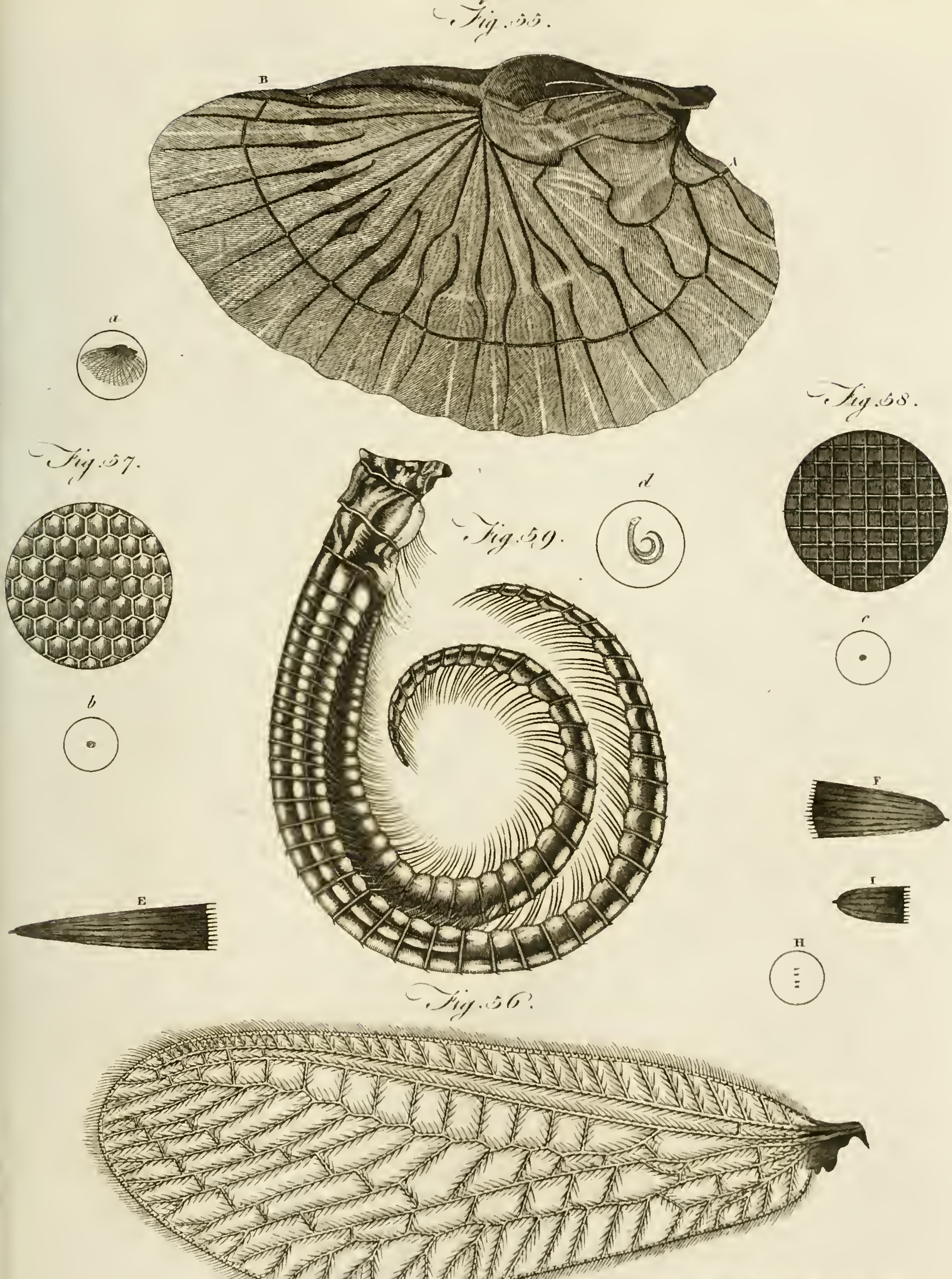
There is nothing in the caterpillar similar to the brain in man. We find indeed in the head of this insect a part from which all the nerves seem to proceed; but this part is entirely unprotected, and so small, that it does not occupy one fifth part of the head: the surface is smooth, and has neither lobes nor any anfractuosity like the human brain. But if we call this a brain in the caterpillar, we must say that it has *thirteen:* for there are twelve other such parts following each other in a straight line, all of them of the same substance with that in the head, and nearly of the same size; and from them, as well as from that in the head, the nerves are distributed thro' the body.

The spinal marrow in the cossus goes along the belly; is very small, forking out at intervals, nearly of the same thickness throughout, except at the ganglions, and is not inclosed in any case. It is by no means so tender as in man; but has a great degree of tenacity, and does not break without a considerable degree of tension. The substance of the ganglions differs from that of the spinal marrow, as no vessels can be discovered in the latter; but the former are full of very delicate ones. There are 94 principal nerves, which divide into innumerable ramifications.

The cossus has two large tracheal arteries, creeping under the skin close to the spiracula; one at the right and the other at the left side of the insect, each of them communicating with the air by means of nine spiracula. They are nearly as long as the whole caterpillar; beginning at the first spiraculum, and extending somewhat farther than the last; some branches also extending quite to the extremity of the body. Round each spiraculum the trachea pushes forth a great number of branches, which are again divided into smaller ones, and these further subdivide and spread through the whole body of the caterpillar. The tracheal artery, with all its numerous ramifications, are open elastic vessels, which may be pressed close together, or drawn out considerably, but return immediately to their usual size when the tension ceases. They are naturally of a silver colour, and make a beautiful appearance. This vessel, with its principal branches, is composed of three coats, which may be separated from one another. The outmost is a thick membrane furnished with a great variety of fibres, which describe a vast number of circles round it, communicating with each other by numerous shoots. The second is very thin and transparent, without any particular vessel being distinguishable in it. The third is composed of scaly threads, generally of a spiral form; and so near each other as scarcely to leave any interval. They are curiously united with the membrane which occupies the intervals; and form a tube which is always open, notwithstanding the flexure of the vessel. There are also many other peculiarities in its structure. The principal tracheal vessels divide into 1326 different branches.

The heart of the cossus is very different from that of larger animals, being almost as long as the animal itself. It lies immediately under the skin at the top of the back, entering the head, and terminating near the mouth. Towards the last rings of the body it is large and capacious, diminishing very much as it approaches the head, from the fourth to the twelfth division. On both sides, at each division, it has an appendage, which partly

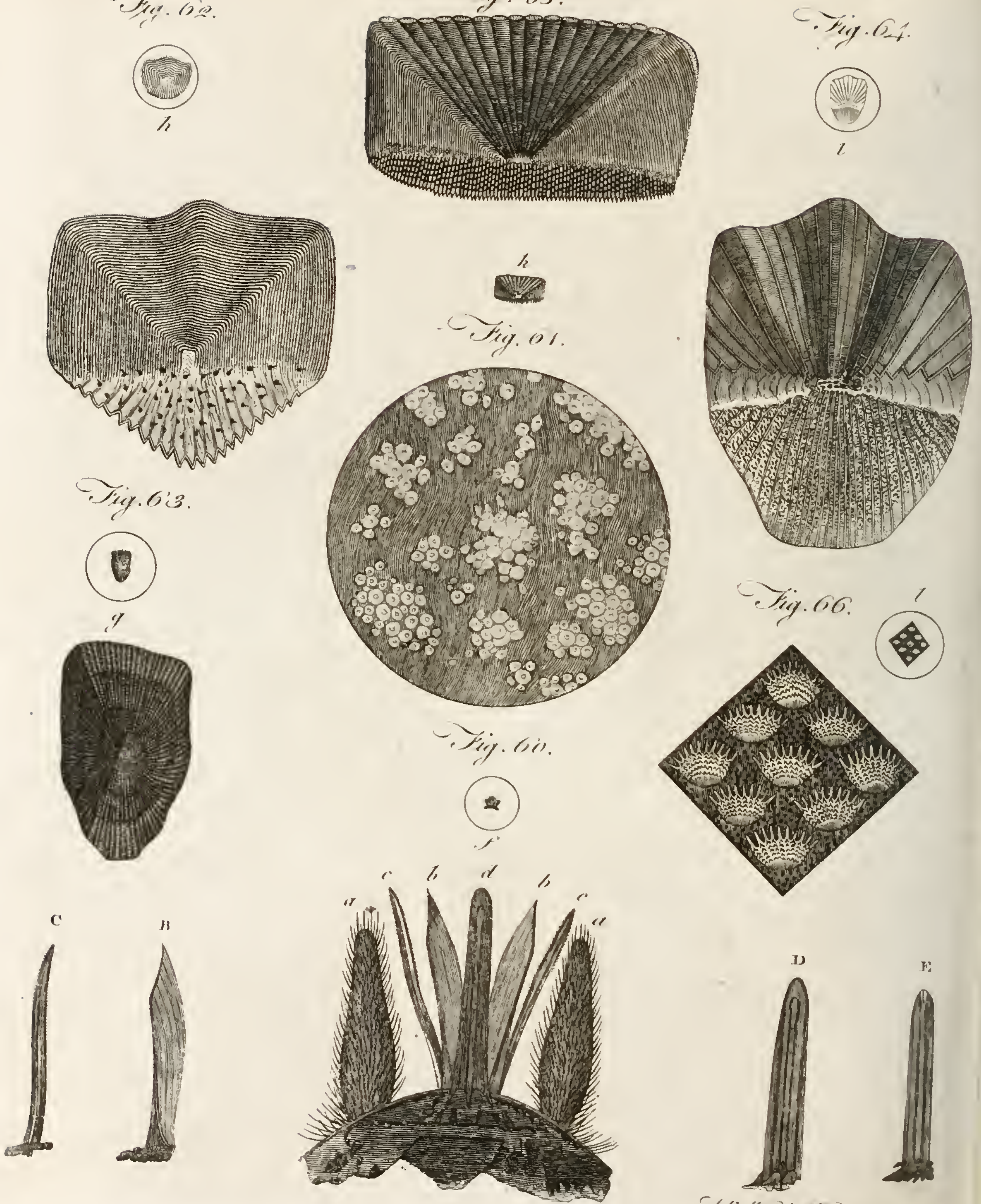
Microscopic Objects.



A. Bell Prin. Wal. Sculptor fecit.

Microscopic Objects.

Plate CCCV



A. Bell Prin. Wal. Sculptor fecit.

Microfcope partly covers the mufcles of the back, but which, growing narrower as it approaches the lateral line, it forms a number of irregular lozenge-fhaped bodies.—This tube, however, feems to perform none of the functions of the heart in larger animals, as we find no veffel opening into it which anfwers either to the aorta or vena cava. It is called the heart, becaufe it is generally filled with a kind of lymph, which naturalifts have fuppofed to be the blood of the caterpillar; and becaufe in all caterpillars which have a tranfparent fkin, we may perceive alternate regular contractions and dilatations along the fuperior line, beginning at the eleventh ring, and proceeding from ring to ring, from the fourth; whence this veffel is thought to be a ftring or row of hearts. There are two white oblong bodies which join the heart near the eighth divifion; and thefe have been called *reniform* bodies, from their having fomewhat of the fhape of a kidney.

The moft confiderable part of the whole caterpillar with regard to bulk is the corpus craffum. It is the firft and only fubftance that is feen on opening it. It forms a kind of fheath which envelopes and covers all the entrails, and, introducing itfelf into the head, enters all the mufcles of the body, filling the greateft part of the empty fpaces in the caterpillar. It very much refembles the configuration of the human brain, and is of a milk-white colour.

The oefophagus defcends from the bottom of the mouth to about the fourth divifion. The fore-part, which is in the head, is flefhy, narrow, and fixed by different mufcles to the cruftaceous parts of it; the lower part, which paffes into the body, is wider, and forms a kind of membranaceous bag, covered with very fmall mufcles; near the ftomach it is narrower, and, as it were, confined by a ftrong nerve fixed to it at diftant intervals. The ventricle begins a little above the fourth divifion, where the oefophagus ends, and finifhes at the tenth. It is about feven times as long as broad; and the anterior part, which is broadeft, is generally folded. Thefe folds diminifh with the bulk as it approaches the inteftines; the furface is covered with a great number of aerial veffels, and opens into a tube, which M. Lyonet calls the large inteftine.—There are three of thefe large tubes, each of which differs fo much from the reft, as to require a particular name to diftinguifh it from them.

The two veffels from which the coffus fpins its filk are often above three inches long, and are diftinguifhed into three parts; the anterior, intermediate, and pofterior. It has likewife two other veffels, which are fuppofed to prepare and contain the liquor for diffolving the wood on which it feeds.

Plate CCCIV. Fig. 55. fhews the wing of an earwig magnified; *a* reprefents it of the natural fize. The wings of this infect are fo artificially folded up under fhort cafes, that few people imagine they have any. Indeed, they very rarely make ufe of their wings. The cafes under which they are concealed are not more than a fixth part of the fize of one wing, though a fmall part of the wing may be difcovered, on a careful infpection, projecting from under them. The upper part of the wing is cruftaceous and opaque, but the under part is beautifully tranfparent. In putting up their wings, they firft fold back the parts AB, and then fhut up the ribs like a fan; the ftrong mufcles ufed for this purpofe being feen at the upper part of the figure. Some of the ribs are extended from the centre to the outer edge; others only from the edge about half way: but they are all united by a kind of band, at a fmall but equal diftance from the edge; the whole evidently contrived to ftrengthen the wing, and facilitate its various motions. The infect itfelf differs very little in appearance in its three different ftates. De Geer afferts, that the female hatches eggs like a hen, and broods over her young ones as a hen does.

Fig. 56. reprefents a wing of the *Hemerobius perla* magnified. It is an infect which feldom lives more than two or three days.—The wings are nearly of a length, and exactly fimilar to one another. They are compofed of fine delicate nerves, regularly and elegantly difpofed as in the figure, beautifully adorned with hairs, and lightly tinged with green. The body is of a fine green colour; and its eyes appear like two burnifhed beads of gold, whence it has obtained the name of *golden eye*. This infect lays its eggs on the leaves of the plum or the rofe tree; the eggs are of a white colour, and each of them fixed to a little pedicle or foot-ftalk, by which means they ftand off a little from the leaf, appearing like the fructification of fome of the moffes. The larva proceeding from thefe eggs refembles that of the coccinella or lady-cow, but is much more handfome. Like that, it feeds upon aphides or pucerons, fucking their blood, and forming itfelf a cafe with their dried bodies; in which it changes into the pupa ftate, from whence they afterwards emerge in the form of a fly.

Fig. E, F, I, reprefent the duft of a moth's wing magnified. This is of different figures in different moths. The natural fize of thefe fmall plumes is reprefented at H.

Fig. 57. fhows a part of the cornea of the libellula magnified. In fome pofitions of the light, the fides of the hexagons appear of a fine gold colour, and divided by three parallel lines. The natural fize of the part magnified is fhown at *b*.

Fig. 58. fhows the part *c* of a lobfter's cornea magnified.

Fig. 59. fhows one of the arms or horns of the lepas antifera, or barnacle, magnified; its natural fize being reprefented at *d*. Each horn confifts of feveral joints, and each joint is furnifhed on the concave fide of the arm with long hairs. When viewed in the microfcope, the arms appear rather opaque; but they may be rendered tranfparent, and become a moft beautiful object, by extracting out of the interior cavity a bundle of longitudinal fibres, which runs the whole length of the arm. Mr Needham thinks that the motion and ufe of thefe arms may illuftrate the nature of the rotatory motion in the wheel-animal. In the midft of the arms is an hollow trunk, confifting of a jointed hairy tube, which inclofes a long round tongue that can be pufhed occafionally out of the tube or fheath, and retracted occafionally. The mouth of the animal confifts of fix laminæ, which go off with a bend, indented like a faw on the convex edge, and by their circular difpofition are fo ranged, that the teeth, in the alternate elevation and depreffion of each plate, act againft whatever comes between them. The plates are placed together in fuch a manner, that to the naked eye they form an aperture not much unlike the mouth of a contracted purfe.

Plate CCCV. Fig. 60. fhows the apparatus of the *Tabanus* or Gadfly,

fly, by which it pierces the skin of horses and oxen, in order to suck their blood. The whole is contained in a fleshy case, not expressed in the figure. The feelers *aa* are of a spongy texture and grey colour, covered with short hairs. They are united to the head by a small joint of the same substance. They defend the other parts of the apparatus, being laid upon it side by side whenever the animal stings, and thus preserve it from external injury. The wound is made by the two lancets *bb* and B, which are of a delicate structure, but very sharp, formed like the dissecting knife of an anatomist, growing gradually thicker to the back.—The two instruments *cc* and C, appear as if intended to enlarge the wound, by irritating the parts round it; for which they are jagged or toothed. They may also serve, from their hard and horny texture, to defend the tube *e* E, which is of a softer nature, and tubular, to admit the blood, and convey it to the stomach. This part is totally inclosed in a line *d* D, which entirely covers it. These parts are drawn separately at B, C, D, E. De Geer observes, that only the females suck the blood of animals; and Reaumur informs us, that having made one, that had sucked its fill, disgorge itself, the blood it threw up appeared to him to be more than the whole body of the insect could have contained. The natural size of this apparatus is shown at *f*.

Fig. 61. shows a bit of the skin of a lump-fish *(Cyclopterus)* magnified. When a good specimen of this can be procured, it forms a most beautiful object. The tubercles exhibited in the figure probably secrete an unctuous juice.

Fig. 62. shows the scale of a sea-perch found on the English coast; the natural size is exhibited at *h*.

Fig. 63. is the scale of an haddock magnified; its natural size as within the circle.

Fig. 64. the scale of a parrot fish from the West Indies magnified; *l* the natural size of it.

Fig. 65. the scale of a kind of perch in the West Indies magnified; *k* the natural size of the scale.

Fig. 66. part of the skin of a sole fish, as viewed through an opaque microscope; the magnified part, in its real size, shown at *l*.

The scales of fishes afford a great variety of beautiful objects for the microscope. Some are long; others round, square, &c. varying considerably not only in different fishes, but even in different parts of the same fish. Leeuwenhoeck supposed them to consist of an infinite number of small scales or strata, of which those next to the body of the fish are the largest. When viewed by the microscope, we find some of them ornamented with a prodigious number of concentric flutings, too near each other, and too fine to be easily enumerated. These flutings are frequently traversed by others diverging from the centre of the scale, and generally proceeding from thence in a straight line to the circumference.

For a more full information concerning these and other microscopical objects, the reader may consult Mr Adams's *Essays on the Microscope*, who has made the most valuable collection that has yet appeared on the subject. See also the articles ANIMALCULE, CRYSTALLIZATION, POLYPE, PLANTS, and WOOD, in the present Work.

MIDAS (fab. hist.), a famous king of Phrygia, who having received Bacchus with great magnificence, that god, out of gratitude, offered to grant him whatever he should ask. Midas desired that every thing he touched should be changed into gold. Bacchus consented; and Midas, with extreme pleasure, everywhere found the effects of his touch. But he had soon reason to repent of his folly: for wanting to eat and drink, the aliments no sooner entered his mouth than they were changed into gold. This obliged him to have recourse to Bacchus again, to beseech him to restore him to his former state; on which the god ordered him to bathe in the river Pactolus, which from thence forward had golden sands. Some time after, being chosen judge between Pan and Apollo, he gave another instance of his folly and bad taste, in preferring Pan's music to Apollo's; on which the latter being enraged, gave him a pair of asses ears. This Midas attempted to conceal from the knowledge of his subjects: but one of his servants saw the length of his ears, and being unable to keep the secret, yet afraid to reveal it from apprehension of the king's resentment, he opened a hole in the earth, and after he had whispered there that Midas had the ears of an ass, he covered the place as before, as if he had buried his words in the ground. On that place, as the poets mention, grew a number of reeds, which when agitated by the wind uttered the same sound that had been buried beneath, and published to the world that Midas had the ears of an ass. Some explain the fable of the ears of Midas, by the supposition that he kept a number of informers and spies, who were continually employed in gathering every seditious word that might drop from the mouths of his subjects. Midas, according to Strabo, died of drinking bull's hot blood. This he did, as Plutarch mentions, to free himself from the numerous ill dreams which continually tormented him. Midas, according to some, was son of Cybele. He built a town which he called *Ancyra*.

MIDAS, *Ear-shell*, the smooth ovato-oblong buccinum, with an oblong and very narrow mouth. It consists of six volutions, but the lower one alone makes up almost the whole shell.

MID-HEAVEN, the point of the ecliptic that culminates, or in which it cuts the meridian.

MIDDLEBURG, one of the Friendly Islands in the South Sea. This island was first discovered by Tasman, a Dutch navigator, in January 1742-3; and is called by the natives *Ea-Oo-whe:* it is about 16 miles from north to south, and in the widest part about 8 miles from east to west. The skirts are chiefly laid out in plantations, the south-west and north-west sides especially. The interior parts are but little cultivated, though very capable of it: but this neglect adds greatly to the beauty of the island; for here are agreeably dispersed groves of cocoa-nuts and other trees, lawns covered with thick grass, here and there plantations and paths leading to every part of the island, in such beautiful disorder, as greatly to enliven the prospect. The hills are low; the air is delightful; but unfortunately water i denied to this charming spot. Yams, with other roots, bananas, and bread-fruit, are the principle articles of food; but the latter appeared to be scarce. Here is the pepper-tree, or *ava-ava*, with which they make an intoxicating liquor, in the same disgusting manner as is practised in the Society Islands. Here are several odoriferous trees and shrubs, par-

particularly a ſpecies of the lemon-tribe; and the botanical gentlemen met with various new ſpecies of plants. Here alſo are a few hogs and fowls.

There are no towns or villages; moſt of the houſes are built in plantations, which are laid out in different parts, with no other order than what convenience requires. They are neatly conſtructed, but are leſs roomy and convenient than thoſe in the Society Iſles. The floors are a little raiſed, and covered with thick ſtrong mats. The ſame ſort of matting ſerves to incloſe them on the windward ſide, the others being open. They have little areas before moſt of them, which are planted round with trees or ornamental ſhrubs, whoſe fragrance perfumes the air. Their houſehold furniture conſiſts of a few wooden platters, cocoa-nut ſhells, and pillows made of wood, and ſhaped like four-footed ſtools or forms: their common clothing, with the addition of a mat, ſerves them for bedding.

The natives are of a clear mahogany or cheſnut brown, with black hair, in ſhort frizzled curls, which ſeems to be burnt at the tips; their beards are cut or ſhaven. The general ſtature of the men is equal to our middle ſize, from five feet three to five feet ten inches; the proportions of the body are very fine, and the *contours* of the limbs extremely elegant, though ſomething more muſcular than at Otaheite, which may be owing to a greater and more conſtant exertion of ſtrength in their agriculture and domeſtic economy. Their features are extremely mild and pleaſing; and differ from the old Otaheitian faces in being more oblong than round, the noſe ſharper, and the lips rather thinner. The women are, in general, a few inches ſhorter than the men, but not ſo ſmall as the lower claſs of women at the Society Iſlands. The practice of puncturing the ſkin, and blacking it, which is called *tattowing*, is in full force among the men here, for their belly and loins are very ſtrongly marked in configurations more compounded than thoſe at Otaheite. The tendereſt parts of the body were not free from theſe punctures; the application of which, beſides being very painful, muſt be extremely dangerous on glandulous extremities.

The men in general go almoſt naked, having only a ſmall piece of cloth round the loins, but ſome wrapt it in great abundance round them from their waiſt: this cloth is manufactured much like that at Otaheite, but overſpread with a ſtrong glue, which makes it ſtiff, and fit to reſiſt the wet The women are likewiſe covered from the waiſt downwards: they often have looſe necklaces, conſiſting of ſeveral ſtrings of ſmall ſhells, ſeeds, teeth of fiſhes; and in the middle of all, the round *operculum*, or cover of a ſhell as large as a crown-piece. The men frequently wear a ſtring round their necks, from which a mother-of-pearl ſhell hangs down on the breaſt; both the ears of the women were perforated with two holes, and a cylinder cut out of tortoiſe-ſhell or bone was ſtruck through both the holes. The moſt remarkable circumſtance obſerved of this people was, that moſt of them wanted the little finger on one, and ſometimes on both hands: the difference of ſex or age did not exempt them from this amputation; for even among the few children that were ſeen running about naked, the greater part had already ſuffered ſuch loſs. This circumſtance was obſerved by Taſman. Another ſingularity which was obſerved to be very general among theſe people, was a round ſpot on each cheek-bone, which appeared to have been burnt or bliſtered. On ſome it ſeemed to have been recently made, on others it was covered with ſcurf, and many had only a ſlight mark of its former exiſtence: how, or for what purpoſe it was made, could not be learnt. The women here, in general, were reſerved; and turned, with diſguſt, from the immodeſt behaviour of ungovernable ſeamen: there were not, however, wanting ſome who appeared to be of eaſy virtue, and invited their lovers with laſcivious geſtures. The language ſpoken here is ſoft, and not unpleaſing; and whatever they ſaid was ſpoken in a kind of ſinging tone. Omai and Mahine, who were both paſſengers on board the ſhip, at firſt declared that the language was totally new and unintelligible to them; however, the affinity of ſeveral words being pointed out, they ſoon caught the particular modification of this dialect, and converſed much better with the natives than any on board the ſhips could have done, after a long intercourſe. They have the neateſt ornaments imaginable, conſiſting of a number of little flat ſticks, about five inches long, of a yellow wood like box, firmly and elegantly connected together at the bottom by a tiſſue of the fibres of cocoa-nut, ſome of which were of their natural colour, and others dyed black; the ſame fibres were likewiſe uſed in the making of baſkets, the taſte of which was highly elegant, and varied into different forms and patterns. Their clubs are of a great variety of ſhapes, and many of them ſo ponderous as ſcarce to be managed with one hand. The moſt common form was quadrangular, ſo as to make a rhomboid at the broad end, and gradually tapering into a round handle at the other. Far the greater part were carved all over in many chequered patterns, which ſeemed to have required a long ſpace of time, and incredible patience, to work up; as a ſharp ſtone, or a piece of coral, are the only tools made uſe of: the whole ſurface of the plain clubs was as highly poliſhed as if an European workman had made them with the beſt inſtruments. Beſides clubs, they have ſpears of the ſame wood, which were ſometimes plain ſharp-pointed ſticks, and ſometimes barbed with a ſting-ray's tail. They have likewiſe bows and arrows of a peculiar conſtruction: the bow, which is ſix feet long, is about the thickneſs of a little finger, and when ſlack forms a ſlight curve; its convex part is channelled with a ſingle deep groove, in which the bow-ſtring is lodged. The arrow is made of reed, near ſix feet long, and pointed with hard wood: when the bow is to be bent, inſtead of drawing it ſo as to increaſe the natural curvature, they draw it the contrary way, make it perfectly ſtraight, and then form the curve on the other ſide. Moſt of their canoes have outriggers, made of poles, and their workmanſhip is very admirable: two of theſe canoes are joined together with a ſurpriſing exactneſs, and the whole ſurface receives a very curious poliſh. Their paddles have ſhort broad blades, ſomething like thoſe at Otaheitee, but more neatly wrought and of better wood

They keep their dead above ground, after the manner of the Society Iſlands; as a corpſe was ſeen depoſited on a low hut.

Here were ſeen ſeveral men and women afflicted with leprous diſeaſes, in ſome of whom the diſorder had riſen to a high degree of virulence: one man in par-

particular had his back and shoulders covered with a large cancerous ulcer, which was perfectly livid within, and of a bright yellow all round the edges. A woman w s likewise unfortunate enough to have her face destroyed by it in the most shocking manner; there was only a hole left in the place of her nose; her cheek was swelled up, and continually oozing out a purulent matter; and her eyes seemed ready to fall out of her head, being bloody and sore: though these were some of the most miserable objects that could possibly be seen, yet they seemed to be quite unconcerned about their misfortunes, and traded as briskly as any of the rest.

MIDDLELAM, a town in the north-riding of Yorkshire, situated on the river Ure, 255 miles from London. It had once a castle, where was born Edward prince of Wales, only son of Richard III.; and is noted for a woollen manufactory and frequent horse-races. Its market is on Monday; and fairs Nov. 6. and 7. The town stands on a rising ground; and the castle, which was on the south side, was formerly moated round by the help of a spring conveyed in pipes from the higher grounds. The church of Middlam is extra-parochial.

MIDDLESEX, a county of England, which derives its name from its situation amidst the three kingdoms of the East, West, and South Saxons. It is bounded on the north by Hertfordshire; on the south by the river Thames, which divides it from Surry; on the west by the river Colne, which separates it from Buckinghamshire; and on the east by the river Lea, which divides it from Essex. It extends about 23 miles in length, but hardly 14 in breadth, and is not more than 115 in circumference; but as it comprehends the two vast cities of London and Westminster, which are situated in the south-east part of the county, it is by far the wealthiest and most populous county in England. It is divided into 602 liberties, containing 200 parishes, besides a vast number of chapels of ease, and 5 maket-towns, exclusive of the cities of London and Westminster. The air is very pleasant and healthy, to which a fine gravelly soil does not a little contribute. The soil produces plenty of corn, and the county abounds with fertile meadows and gardeners grounds. In a word, the greater part of the county is so prodigiously assisted by the rich compost from London, that the whole of the cultivated part may be considered as a garden. The natural productions are cattle, corn, and fruit; but its manufactures are too many to be enumerated here, there being hardly a single manufacture practised in Great Britain but what is also established in this county.—Though London is the chief city, Brentford is the county-town where the members of parliament are elected.

MIDDLETON (Dr Conyers), a very celebrated English divine, the son of a clergyman in Yorkshire, was born at Richmond in 1683. He distinguished himself, while fellow of Trinity-college, Cambridge, by his controversy with Dr Bentley his master, relating to some mercenary conduct of the latter in that station. He afterwards had a controversy with the whole body of physicians, on the dignity of the medical profession; concerning which he published *De medicorum apud veteres Romanos degentium conditione dissertatio; qua, contra viros celeberrimos Jacobum Sponium et Richardum Meadium, servilem atque ignobilem eam fuisse, ostenditur:* and in the course of this dispute much resentment and many pamphlets appeared. Hitherto he had stood well with his clerical brethren; but he drew the resentment of the church on him in 1729, by writing "A letter from Rome, showing an exact conformity between popery and paganism," &c.; as this letter, though politely written, yet attacked Popish miracles with a gaiety that appeared dangerous to the cause of miracles in general. Nor were his Objections to Dr Waterland's manner of vindicating Scripture against Tindal's "Christianity as old as the Creation," looked on in a more favourable point of view. In 1741, came out his great work, "The history of the life of M. Tullius Cicero," 2 vols 4to; which is indeed a fine performance, and will probably be read as long as taste and polite literature subsist among us: the author has nevertheless fallen into the common error of biographers, who often give panegyrics instead of history. In 1748, he published, "A free inquiry into the miraculous powers which are supposed to have subsisted in the Christian church from the earliest ages, through several successive centuries." He was now attacked from all quarters; but before he took any notice of his antagonists, he supplied them with another subject in "An examination of the lord bishop of London's discourses concerning the use and extent of prophecy," &c. Thus Dr Middleton continued to display talents and learning, which were highly esteemed by men of a free turn of mind, but by no means in a method calculated to invite promotion in the clerical line. He was in 1723 chosen principal librarian of the public library at Cambridge; and if he rose not to dignities in the church, he was in easy circumstances, which permitted him to assert a dignity of mind often forgotten in the career of preferment. He died in 1750, at Hildersham in Cambridgeshire, an estate of his own purchasing; and in 1752, all his works, except the life of Cicero, were collected in 4 vols, 4to.

MIDDLEWICH, a town of Cheshire, 167 miles from London. It stands near the conflux of the Croke and Dan, where are two salt-water springs, from which are made great quantities of salt, the brine being said to be so strong as to produce a full fourth part sa t. It is an ancient borough, governed by burgesses; and its parish extends into many adjacent townships. It has a spacious church. Its market is on Tuesdays; and fairs on St James's-day, July 25. and Holy-Thursday. By the late inland navigation, it has communication with the rivers Mersey, Dee, Ribble, Ouse, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancaster, Westmoreland, Stafford, Warwick, Leicester, Oxford, Worcester, &c. The river Wheelock, after a course of about 12 miles from Mowcop-hill, runs into the Dan a little above this town.

MIDHURST, a town of Sussex, 52 miles from London, has been represented in parliament ever since the 4th of Edward II. It is a neat small town, on a hill surrounded with others, having the river Arun at the bottom; and is a borough by prescription, governed by a bailiff, chosen annually by a jury at a court-leet of the lord of the manor. The market is on Thursday; fairs on March 21. and the Thursday after.

MIDIAN, or Madian (anc. geog.), a town on the ſouth ſide of Arabia Petræa; ſo called from one of the ſons of Abraham by Keturah.—Another *Midian*, near the Arnon and Æoplis, in ruins in Jerome's time. With the daughters of theſe Midianites the Iſraelites committed fornication, and were guilty of idolatry. A branch of the Midianites dwelt on the Arabian gulph, and were called *Kenites;* ſome of whom turned proſelytes, and dwelt with the Iſraelites in the land of Canaan.

MID-LOTHIAN. See Lothian.

MIDSHIP-frame, a name given to that timber, or combination of pieces formed into one timber, which determines the extreme breadth of the ſhip, as well as the figure and dimenſion of all the inferior timbers.

In the article *Ship-Building*, the reader will find a full explanation of what is meant by a frame of timbers. He will alſo perceive the outlines of all the principal frames, with their gradual dimenſions, from the midſhip-frame delineated in the plane of projection annexed to that article. As the parts of which the ſeveral frames are compoſed have the ſame relation to each other throughout the veſſel, and as all the correſponding pieces, without and within thoſe frames, are alſo nearly alike, and fixed in the ſame manner, it will be here ſufficient for our purpoſe to repreſent the principal or midſhip-frame, together with its correſponding parts, which are as follow:—A, the keel, with *a* the ſalſe keel beneath it. B, the chocks fixed upon the kelſon, to retain the oppoſite pieces of the *riders* firmly together. C, one of the beams of the orlop. D, one of the lower deck beams; with *d* the beams of the upper deck. E, the hanging-knees, by which the beams are attached to the timbers. F, the ſtandards, which are fixed above the decks to which they belong. G, the clamps, which ſuſtain the extremities of the beams. H, the gun-ports of the lower-deck; with *h* the ports of the upper-deck. I, K, L, different pieces of *thick-ſtuff*, placed oppoſite to the ſeveral ſcarfs or joinings, in the frame of timbers. M, the planks of the deck. N, the water-ways. O, the planks of the ceiling, between the ſeveral ranges of thick-ſtuff. P, the ſpirketing. Q, the main-wale, to fortify the ſhip's ſide oppoſite to the lower deck. R, the channel-wale, oppoſite to the upper deck. S, the waiſt-rail. T, the ſtring, with the moulding under the gun-wale. U, the floor-timbers, which are laid acroſs the keel and bolted to it. V, the ſeveral futtocks; and W the top-timbers, which are all united into one frame. X, the kelſon.

Plate CCCXIII.

MIDSHIPMAN, a ſort of naval cadet, appointed by the captain of a ſhip of war, to ſecond the orders of the ſuperior officers, and aſſiſt in the neceſſary buſineſs of the veſſel, either aboard or aſhore.

The number of midſhipmen, like that of ſeveral other officers, is always in proportion to the ſize of the ſhip to which they belong. Thus a firſt-rate man of war has 24, and the inferior rates a ſuitable number in proportion. No perſon can be appointed lieutenant without having previouſly ſerved two years in the royal navy in this capacity, or in that of *mate*, beſides having been at leaſt four years in actual ſervice at ſea, either in merchant-ſhips or in the royal navy.

Midſhipman is accordingly the ſtation in which a young volunteer is trained in the ſeveral exerciſes neceſſary to attain a ſufficient knowledge of the machinery, movements, and military operations of a ſhip, to qualify him for a ſea-officer.

On his firſt entrance in a ſhip of war, every midſhipman has ſeveral diſadvantageous circumſtances to encounter. Theſe are partly occaſioned by the nature of the ſea-ſervice; and partly by the miſtaken prejudices of people in general reſpecting naval diſcipline, and the genius of ſailors and their officers. No character, in their opinion, is more excellent than that of the common ſailor, whom they generally ſuppoſe to be treated with great ſeverity by his officers, drawing a compariſon between them not very advantageous to the latter. The midſhipman uſually comes aboard tinctured with theſe prejudices, eſpecially if his education has been amongſt the higher rank of people; and if the officers happen to anſwer his opinion, he conceives an early diſguſt to the ſervice, from a very partial and incompetent view of its operations. Blinded by theſe prepoſſeſſions, he is thrown off his guard, and very ſoon ſurpriſed to find, amongſt thoſe honeſt ſailors, a crew of abandoned miſcreants, ripe for any miſchief or villany. Perhaps, after a little obſervation, many of them will appear to him equally deſtitute of gratitude, ſhame, or juſtice, and only deterred from the commiſſion of any crimes by the terror of ſevere puniſhment. He will diſcover, that the pernicious example of a few of the vileſt in a ſhip of war are too often apt to poiſon the principles of the greateſt number, eſpecially if the reins of diſcipline are too much relaxed, ſo as to foſter that idleneſs and diſſipation, which engender ſloth, diſeaſes, and an utter profligacy of manners. If the midſhipman on many occaſions is obliged to mix with theſe, particularly in the exerciſes of extending or reducing the ſails in the tops, he ought reſolutely to guard againſt this contagion, with which the morals of his inferiors may be infected. He ſhould, however, avail himſelf of their knowledge, and acquire their expertneſs in managing and fixing the ſails and rigging, and never ſuffer himſelf to be excelled by an inferior. He will probably find a virtue in almoſt every private ſailor, which is entirely unknown to many of his officers: that virtue is emulation, which is not indeed mentioned amongſt their qualities by the gentlemen of *terra firma*, by whom their characters are often copiouſly deſcribed with very little judgment. There is hardly a common tar who is not envious of ſuperior ſkill in his fellows, and jealous on all occaſions to be outdone in what he conſiders as a branch of his duty: nor is he more afraid of the dreadful conſequences of whiſtling in a ſtorm, than of being ſtigmatiſed with the opprobrious epithet of *lubber*. Fortified againſt this ſcandal, by a thorough knowledge of his buſineſs, the ſailor will ſometimes ſneer in private at the execution of orders which to him appear aukward, improper, or unlike a ſeaman. Nay, he will perhaps be malicious enough to ſuppreſs his own judgment, and, by a punctual obedience to command, execute whatever is to be performed in a manner which he knows to be improper, in order to expoſe the perſon commanding to diſgrace and ridicule. Little ſkilled in the method of the ſchools, he conſiders the officer

Midshipman. officer who cons his leſſon by rote as very ill qualified for his ſtation, becauſe particular ſituations might render it neceſſary for the ſaid officer to aſſiſt at putting his own orders in practice. An ignorance in this practical knowledge will therefore neceſſarily be thought an unpardonable deficiency by thoſe who are to follow his directions. Hence the midſhipman who aſſociates with theſe ſailors in the tops, till he has acquired a competent ſkill in the ſervice of extending or reducing the ſails, &c. will be often entertained with a number of ſcurrilous jeſts, at the expence of his ſuperiors. Hence alſo he will learn, that a timely application to thoſe exerciſes can only prevent him from appearing in the ſame deſpicable point of view, which muſt certainly be a cruel mortification to a man of the ſmalleſt ſenſibility.

If the midſhipman is not employed in theſe ſervices, which are undoubtedly neceſſary to give him a clearer idea of the different parts of his occupation, a variety of other objects preſent themſelves to his attention. Without preſuming to dictate the ſtudies which are moſt eſſential to his improvement, we could wiſh to recommend ſuch as are moſt ſuitable to the bent of his inclination. Aſtronomy, geometry, and mechanics, which are in the firſt rank of ſcience, are the materials which form the ſkilful pilot and the ſuperior mariner. The theory of navigation is entirely derived from the two former, and all the machinery and movements of a ſhip are founded upon the latter. The action of the wind upon the ſails, and the reſiſtance of the water at the ſtem, naturally dictate an inquiry into the property of ſolids and fluids; and the ſtate of the ſhip, floating on the water, ſeems to direct his application to the ſtudy of hydroſtatics, and the effects of gravity. A proficiency in theſe branches of ſcience will equally enlarge his views, with regard to the operations of naval war, as directed by the efforts of powder and the knowledge of projectiles. The moſt effectual method to excite his application to thoſe ſtudies, is, perhaps, by looking round the navy, to obſerve the characters of individuals. By this inquiry he will probably diſcover, that the officer who is eminently ſkilled in the ſciences, will command univerſal reſpect and approbation; and that whoever is ſatisfied with the deſpicable ambition of ſhining the hero of an aſſembly, will be the object of univerſal contempt. The attention of the former will be engaged in thoſe ſtudies which are highly uſeful to himſelf in particular, and to the ſervice in general. The employment of the latter is to acquire thoſe ſuperficial accompliſhments that unbend the mind from every uſeful ſcience, emaſculate the judgment, and render the hero infinitely more dexterous at falling into his ſtation in the dance than in the line of battle.

Unleſs the midſhipman has an unconquerable averſion to the acquiſition of thoſe qualifications which are ſo eſſential to his improvement, he will very rarely want opportunities of making a progreſs therein. Every ſtep he advances in thoſe meritorious employments will facilitate his acceſſion to the next in order. If the dunces, who are his officers or meſs-mates, are rattling the dice, roaring bad verſes, hiſſing on the flute, or ſcraping diſcord from the fiddle, his attention to more noble ſtudies will ſweeten the hours of relaxation. He ſhould recollect, that no example from fools ought to influence his conduct, or ſeduce him from that laudable ambition which his honour and advantage are equally concerned to purſue.

MIDWIFE, one whoſe profeſſion is to deliver women in labour. See MIDWIFERY.

MIDWIFERY,

THE art of aſſiſting women in the birth of children. It is ſuppoſed to comprehend alſo the management of women both before and after delivery, as well as the treatment of the child in its moſt early ſtate.

History of Midwifery. The art of midwifery is certainly almoſt coeval with mankind. The firſt *midwife* of whom mention is made under that name, aſſiſted at the ſecond labour of Rachel, the wife of Jacob. Another midwife is ſpoken of in Geneſis, at the lying-in of Thamar, who was delivered of twins. But the moſt honourable mention of midwives is that in Exodus, when Pharaoh king of Egypt, who had a mind to deſtroy the Hebrews, commanded the midwives to kill all the male children of the Hebrew women; which command they diſobeyed, and thereby obtained a recompence from God.

From all the paſſages in Scripture where midwives are mentioned, it is plain, that women were the only practitioners of this art among the Hebrews. Among the Greeks alſo women aſſiſted at labours. Phanarete, the mother of Socrates, was a midwife. Plato ſpeaks at large of midwives, explains their functions, regulates their duties, and remarks that they had at Athens the right of propoſing or making marriages. Hippocrates makes mention of midwives, as well as Ariſtotle, Galen, and Aëtius. This laſt even frequently quotes a woman called *Aſpaſia*, who was probably a midwife. They were called among the Greeks Μαιαι or Ιατρομαιαι; that is to ſay, *mamma*, or *grand-mamma*.

We are ſtill better acquainted with the cuſtoms of the Romans, and know that they employed women only. This may be deduced from the comedies of Plautus and Terence alone. We there ſee that they are women only who are called to aſſiſt perſons in labour. Beſides, Pliny, in his Natural Hiſtory, frequently ſpeaks of midwives and their duties; and names two, *Sotira* and *Salpe*, who had apparently the greateſt reputation. Women were alſo employed after the fall of the empire; and it is certain, that, till lately, all civilized nations have employed women only as midwives. This appears even from their names in many different languages, which are all feminine. There were, however, eſpecially in great cities, ſurgeons who applied themſelves to the art of midwifery, and made it their peculiar ſtudy. They were ſent for in in difficult cafes, where the midwives found their incapacity; and then the furgeon endeavoured to deliver the woman by having recourfe to inftruments ufeful in thofe cafes, as by crotchets, crows-bills, &c.; but as thefe cafes happened but feldom, women remained in poffeffion of this bufinefs. It is certain, according to Aftruc, that Maria Therefia wife of Louis XIV. employed women only in her labours; and the example of the queen determined the conduct of the princeffes and court-ladies, and likewife of the other ladies of the city. The fame author tells us, that he has been affured, that the epoch of the employment of men-midwives goes no farther back than the firft lying-in of Madam de la Valiere in 1663. As fhe defired it might be kept a profound fecret, fhe fent for Julian Clement a furgeon of reputation. He was conducted with the greateft fecrecy into an houfe where the lady was, with her face covered with a hood; and where it is faid the king was concealed in the curtains of the bed. The fame furgeon was employed in the fubfequent labours of the fame lady; and as he was very fuccefsful with her, men-midwives afterwards came into repute, and the princeffes made ufe of furgeons on fimilar occafions; and as foon as this became fafhionable, the name of *acoucheur* was invented to fignify this clafs of furgeons. Foreign countries foon adopted the cuftom, and likewife the name of *acoucheurs*, though they had no fuch term in their own language; but in Britain they have more generally been called *men-midwives*.

In oppofition to this account, which is taken from Aftruc, that author tells us, that he is aware of an objection from Hyginus, who afferts, that the ancients had no midwives; which made the women, through modefty, rather choofe to run the rifk of death than to make ufe of men on this occafion. For the Athenians, he adds, had forbid women and flaves to ftudy phyfic, that is to fay, the art of midwifery. A young woman, named *Agnodice*, defirous of learning this art, cut off her hair, dreffed herfelf in the habit of a man, and became a fcholar to one Hierophilus. She afterwards followed this bufinefs. The women at firft refufed affiftance from her, thinking fhe was a man; but accepted thereof when fhe had convinced them that fhe was a woman.

To this account our author replies, that the authority of Hyginus is by no means to be depended upon. His book is full of folecifms and barbarifms; and therefore cannot be attributed to any writer who lived before the fall of the empire; but muft have been the work of an author who lived when the Latin tongue was corrupted; that is, about the feventh or eighth century. The contradictions met with in this book alfo give room to fufpect that it is not the work of one hand, but of feveral. The authority of fuch a work, therefore, is by no means fufficient to deftroy the teftimonies of thofe writers who affirm, that among the Greeks the care of lying-in women was committed entirely to others of their own fex.

The art of midwifery feems not to have been fo foon improved as that of phyfic. Hippocrates, though an excellent phyfician, feems to have been a very bad midwife. He was acquainted with no other kind of natural labour than that in which the head prefents; and condemns footling labour as fatal both to mother and child: he would have the children in fuch cafes turned, fo that the head may prefent. If, fays he, the arm, or leg, or both, of a living child prefent, they muft, as foon as difcovered, be returned into the womb, and the child brought into the paffage with its head downwards. For this purpofe he advifes to roll the woman on the bed, to fhake her, and make her jump: he propofes the fame expedients to procure the child's delivery; and if they do not fucceed, he advifes to extract it with crotchets, and, whatever happens, to difmember it.

From the time of Hippocrates to that of Celfus, who lived in the reign of the emperor Tiberius, we have no accounts of any improvements in midwifery; but this author gives two very ufeful directions. 1. In dilating the womb: "We muft (fays he) introduce the fore-finger, well moiftened with hog's lard, into the mouth of the womb when it begins to open, and in like manner afterwards a fecond, and fo on until all the fingers are introduced, which are then to be ufed by feparating them, as a kind of dilater, to diftend the orifice, and facilitate the introduction of the hand which is to act in the womb. 2. Children may be delivered by the feet eafily and fafely, without crotchets, by taking hold of their legs. For this purpofe we muft take care to turn children, which are otherwife placed in the womb, with their head or feet downwards." It is true, Celfus fpeaks of a dead child only; but it was eafy to conclude from thence, that the fame practice might be ufed with fuccefs to deliver a living child. Neverthelefs, this was not done; and, notwithftanding the authority of Celfus, the former prejudice continued for a long time. Though Pliny, who lived under the emperors Vefpafian and Titus, was not a phyfician himfelf, yet by condemning footling labour he attefts the opinion of the phyficians of his time. He afferts, as a known fact, that footling labour was a preternatural kind of labour: he adds, that children which came into the world in this manner were called *Agrippa*, that is to fay, born with a great deal of difficulty.

But however common this opinion was, it was never univerfally received; and feveral phyficians of character rofe up, who, without fuffering themfelves to be dazzled with the common prejudice, or feduced by the authority of Hippocrates or Galen, recommended and approved of footling delivery. The queftion then was a long time undecided; and even in 1657, Riverius, a phyfician of reputation, condemned footling labour. Mauriceau alfo remarks, in the firft edition of his book on the diforders of pregnant women, printed in 1664, that many authors were ftill of opinion, that when the child prefented with its feet, it fhould be turned to make it come with its head foremoft; but after having obferved that it is difficult, if not impoffible, to execute this, he concludes, "it is much better to extract the child by its feet when they prefent, than to run the hazard of doing worfe by turning it." All practitioners, however, are now of the fame opinion; and the knowledge of midwifery has been fo much increafed within this century, that it feems to have nearly attained its ultimate perfection, and its operations reduced almoft to a geometrical certainty: And this, fays Aftruc, is not furprifing; for, after all, the art of midwifery is reduced to the following mechanical

chanical problem, "An extensible cavity of a certain capacity being given, to pass a flexible body of a given length and thickness through an opening dilatable to a certain degree." This might be resolved geometrically, if the different degrees of elasticity of the womb, and strength and weakness of the child, the greater or lesser disposition of the blood to inflammation, and the geater or lesser degree of irritability of the nerves, did not occasion that uncertainty which physical facts constantly produce in all physico-mathematical questions.

The study of midwifery in Britain as a science is not of very ancient date. The first book published on the subject appeared in the year 1540, and was intitled *The Byrthe of Mankind*, otherwise named, *The Woman's Booke*, by Thomas Raynold, physition. It underwent a second edition by Thomas Ray, a printer whose name is not much known. It was adorned with prints, and went through several editions, and appears to have been held in high estimation. In 1653, the celebrated William Harvey published his treatise on generation; and afterwards engaging in the practice of midwifery, published his *Exercitatio de partu*. Some notice is also taken by Sydenham of the diseases incident to child-bed women, and of those of young children. About this time several other tracts on subjects relating to midwifery appeared, by Wharton, Charleton, Mayow, &c.; but till about the year 1634, Dr Denman considers the treatise of Raynold already mentioned as being the standard. The appearance of the works of Ambrose Paré, which were now first published, depressed the reputation of Raynold's book; and Dr Chamberlen, a celebrated physician, likewise applied himself about the same time to midwifery. He introduced an instrument into the art called a *forceps*, but which Dr Denman supposes to have been a *vectis*.—He had three sons who likewise practised midwifery, and, as well as himself, obtained considerable character; and one of the young men went over to Paris with a view to sell the secret, or advance his fortune by a practice which he had found so successful in England. In this, however, he was disappointed; the first case in which he was engaged proved unsuccessful, and he suffered much reproach in consequence. Returning to England, therefore, in 1672, he published a translation of Mauriceau's midwifery, which continued in great estimation for many years.

Dr Willoughby, who wrote a treatise on midwifery, quoted in manuscript by Dr Denman, complains of the practice of midwives about this time. He says, that the books upon the subject all copied one another, recommending methods which could not but be prejudicial to the woman; and that particularly they did not attend to the efforts of nature, but endeavoured to force the birth before the proper time. He was the grandson of Sir Francis Willoughby, so much celebrated in the time of queen Elizabeth; and Dr Denman is of opinion, that the fame and fortune acquired by Dr Chamberlen, induced so many gentlemen as now practised midwifery to undertake the study of it, and to make use of instruments as he did. Among these was Dr Bamber; but others attempted to raise their reputation by a quite contrary practice. In 1723, Dr Maubray published a book on midwifery, intitled, *The Female Physician, or the Whole Art of New Improved Midwifery*, in which he violently declaims against the use of instruments; and next year he published an appendix, under the title of *Midwifery brought to perfection*, in which he sets forth in a pompous manner the improvements he had made. This, however, was no more than a syllabus of his lectures, he having been the first public teacher of midwifery in Britain.

Dionis's midwifery made its appearance in 1719, and Deventer's in 1729. The latter, in Dr Denman's opinion, was more esteemed than it deserved, as he generally condemns the use of instruments; notwithstanding which, he thinks it a considerable acquisition to the science in this country.

In 1727 appeared Dr Simson's work, intitled, *The System of the Womb*; "a work (says Dr Denman) of sufficient ingenuity, but not of much use in practice, even if his theory had been true." Chapman's *Treatise on the Improvement of Midwifery* appeared in 1733. He was the second public teacher of midwifery in London, and was the first who described the *forceps*; the description appearing in the third volume of the Edinburgh Medical Essays. His work contains many useful observations. Next year Dr Hody published a collection of cases in midwifery, written by Mr William Giffard. They are 275 in number, occurred in his own practice, and appear to be written with great fidelity. He also gave a plate of the forceps; and, in Dr Denman's opinion, was among the first who asserted that the placenta might be attached over the *os uteri*. In 1736, Thomas Dawke published a book, intitled, *The Midwife rightly Instructed*; and, the following year, *The Midwife's Companion*, by Henry Bracken: but these, as well as some others which made their appearance about the same time, are of no importance.

About the same time also, Sir Richard Manningham quitted the profession of pharmacy, and applied to the study and practice of midwifery. He had received the honour of knighthood in 1730; and in 1739 he established a small hospital or ward for lying-in women, which was the first thing of the kind in the British dominions. Here also he gave lectures; and at the same time qualified his students for practice. He became very eminent in his profession, which he exercised with great humanity, and was accounted a man of great learning. He published a work, intitled *Compendium Artis Obstetricæ*; and another, called *Aphorismata Medica*, relating also chiefly to the art of midwifery. In 1741, Sir Fielding Oulde of Dublin published *A Treatise of Midwifery*; the most important parts of which are some observations on the continuance of the thickness of the uterus during pregnancy, with his description of the manner in which the head of the child passes through the pelvis at the time of the birth; the truth of which observations have since been universally acknowledged.

From this time the English, according to Dr Denman ‡, might be said "to have been in full possession of the subject; all the books written in the neighbouring countries being translated, public lectures given, and an hospital established for the further improvement of the art: and as all the books printed since that time may readily be procured, every gentleman has an opportunity of forming his own opinion of their respective merits. But the college of physicians (adds he), having

‡ *Introduction to the Practice of Midwifery*, preface.

having been pleased, in the year 1783, to form a rank in which those who dedicate themselves to the study of midwifery should be placed, I trust that future accounts will be more correct; and that this measure adopted by the college will promote the public benefit, by confining the industry and abilities of one class of men to this branch of the profession."

In Scotland, though there has for a long time been professors of midwifery, yet the surgeons likewise practise that art as well as their own. Several approved treatises on the subject have appeared in this country; particularly a system by the late Dr Smellie, which has been long held in the highest estimation in both kingdoms; and, within these few years, several excellent performances by Dr Alexander Hamilton of the university of Edinburgh: And, indeed, we may venture to affirm, that both theory and practice of midwifery are as well understood in this kingdom as in any part of the world.

PART I. THEORY OF MIDWIFERY.

Description of the Pelvis in general.

THE subject of this Part comprehends, in a particular manner, the anatomical structure of the pelvis, and other parts concerned in the formation of the child, the theories of conception, generation, &c. of the nutrition, growth of the fœtus, and of the powers by which it is expelled. Of all these some account has been given under other articles; but as the particular description of the pelvis belongs peculiarly to this subject, we shall here give an account of its various conformations, as they in a great measure affect women at the time of child-bearing, and very particularly contribute to the ease or difficulty of the labour.

CHAP. I. *Description of the Pelvis in general.*

Dr DENMAN observes, that the term *pelvis* has been applied indiscriminately to the inferior cavity of the abdomen, and to the bones which form that cavity; but he thinks it most proper to confine it to the bones, and to distinguish the hollow by the name of the cavity of the pelvis. In the state of infancy, the pelvis is composed of five or six bones, most of which in the fœtus are soft and flexible; some of them being, in a manner, quite cartilaginous; while the edges of others are found covered with a substance of the same kind. This construction is thought by some to facilitate delivery, as the pelvis of the fœtus can thus change its figure like the cranium; but M. Baudelocque thinks this an erroneous opinion, "consonant neither to reason nor experience."

In the adult the pelvis consists only of four bones, viz. the *sacrum*, the *os coccygis*, and the two *ossa innominata*. These being already described under the article ANATOMY, we shall here content ourselves with observing, that an anchylosis is not unfrequently formed between the os sacrum and the ossa innominata; and sometimes an imperfect joint in consequence of their separation; whence the part is very much weakened, and the person ever afterwards walks with difficulty.

The os coccygis in infancy is cartilaginous; but in the adult it is composed of three, or more frequently of four bones, connected by intermediate cartilages, the uppermost of which is somewhat broader than the lower part of the os sacrum. In some subjects these bones coalesce, and form a single one: in others an anchylosis is formed between the sacrum and os coccygis; in consequence of which the latter is shortened and turned inwards, so as to obstruct the head of the child in its passage through the pelvis. But the impediment thereby occasioned at the time of labour may be overcome by the force with which the head of the child is propelled, and the os coccygis again separated from the sacrum with a noise loud enough to be distinctly heard. In general, however, some regressive motion is preserved between the bones of which the os coccygis is composed; and that which is produced between the *sacrum* and *os coccygis*, when the latter is pressed by the head of a child passing through the pelvis, occasions a considerable temporary enlargement of the inferior aperture of the pelvis. Any lateral motion is prevented by the insertion of the *coccygæi* muscles, part of the *levatores ani*, and some portions of the sacro-sciatic ligaments into the sides of the *os coccygis*.

The *os innominatum*, in a woman of the ordinary size, is about six inches broad from the anterior to the posterior superior spine. The height is nearly six inches and an half from the anterior spine to the bottom of the tuberosity of the ischium, and seven and an half if taken from the middle of the crista of the ilium; and hence we may in some measure be enabled to determine the depth of the cavity of the pelvis laterally from the superior to the inferior strait.

"The ossa pubis (says M. Baudelocque†) are joined together by means of a substance which has always been described by the name of cartilage, though it differs as much from that as from a ligament. According to some anatomists, each *os pubis* is covered by its own cartilage. Their junction not a true synchondrosis; but a close articulation, which admits only of insensible motions. By carefully examining this symphysis, we observe that each os pubis is really covered by a cartilage at its anterior extremity; that this cartilage is thicker before than behind, and in its superior and inferior parts than in the middle of its length; that these bones, thus covered, are bound together by means of a substance which seems ligamentous, and whose fibres, which are mostly transverse, go from one to the other; that these fibres are so disposed, that the deepest are the shortest, and the most superficial the longest; that they leave between one another a kind of meshes filled with reddish corpuscles, very like those which are seen about the moveable articulations, and which are commonly thought to be synovial glands. We observe farther, that this fibrous and ligamentous substance does not occupy the whole thickness of the symphysis, and does not bind the bones together through the whole extent of the surfaces presented by their anterior extremities; but that there exists a true articulation of the species known by the name of *arthrodia*. If we open this symphysis towards the inside of the pelvis, after a cellular tissue very thin and loose, which we meet with first, we discover a capsular membrane, whose most apparent fibres are transversal; afterwards

† *System of Midwifery*, translated by Mr Heath.

Description of the Pelvis in general.

terwards two cartilaginous facettes, smooth, polished, and moist, from six to eight lines long and two broad, of a figure a little semilunar, lightly convex on one bone and concave on the other. These facettes comprehend nearly the middle third of the length of the symphysis and the posterior third of its thickness.—This symphysis then presents in one third of its extent, or thereabouts, a true articulation; and in the rest a *syneurosis* and *synchondrosis* at the same time.

"This compound and articular substance, being detached from the bones, forms a kind of wedge, whose base constitutes the anterior part of the symphysis, and its edge the posterior; so that these bones seem to touch towards the inside of the pelvis, and appear separated to the distance of several lines without: The base of this kind of wedge is generally from four to six lines broad towards the middle of the length of the symphysis, and from eight to ten in the inferior and superior parts, while the edge at most does not exceed one line. Its thickness, taken according to that of the bones, is greater above than below; where this substance, become thinner, forms what is called the triangular ligament.

"This first means of union was not sufficient to give these bones the firmness necessary for the free exercise of the functions to which the pelvis is destined. It is covered and fortified in all parts, but especially before, by bundles of ligamentous and aponeurotic fibres. Independently of the thick and very strong ligamentous structure which forms the fore-part of the symphysis, we observe bundles of tendinous fibres which decussate each other a thousand ways, some of which arise from the interior *graciles* and the external *obturators*, and others from the external portions of the inguinal rings. The triangular expansion which terminates the symphysis inferiorly, and which forms the top of the arch of the pubes, seems to have other uses than that of binding the bones together.

"The manner in which the *os sacrum* is connected with the *ossa innominata*, differs considerably from that in which the *ossa pubis* are joined. Here each articular facette is covered by a true cartilaginous layer, and there are inequalities on each side, which mutually receive one another, while nothing of that kind is observed in the junction of the pubes; neither are there in any part of these articular facettes any of the transverse fibres which go from one bone to the other in the *ossa pubis*: these articulations, therefore, derive all their strength from the great numbers of ligaments which surround them. Most of these are very short, and do not extend beyond the edges of the articular facettes: but there are others longer to be seen above, below, and behind these symphyses.

"The *os sacrum* is not only articulated with the ilia, but with the spine and coccyx. It is joined in three places to the spine: 1. By an oblong and cartilaginous impression in the middle of the basis, which unites it to a similar impression in the body of the last *lumbar vertebra*, by means of an elastic substance. 2. By two little articular masses fixed in the posterior edge of that first impression, and which answer to similar substances in the vertebra above-mentioned.

"The elastic substance which unites the middle of the base of the sacrum to the spine, is entirely similar in its nature to that seen between the bodies of all the vertebræ. Being very thick before and thin behind, the angle resulting from the disposition of the articular facettes of these two parts is rendered more obtuse. This *sacro-vertebral* junction is surrounded by an infinity of ligaments, some without and others concealed within the spinal canal. All motion is not prohibited by this kind of junction; but, as it only depends on the compression of the intermediate substance, it can be but very small. The motion between the body of the last lumbar vertebra and the base of the sacrum, is never extensive enough to make any alteration in the degree of acuteness of the angle which results from their junction; but the convexity of the lumbar column may be augmented or diminished by means of a compound motion, formed of those which take place between each of the lower lumbar vertebræ and between the lower ones of the back. This augmentation or diminution of the convexity, in proportion as the trunk is bent backward or forward, or by raising or lowering the breech when the woman lies on her back, deserves particular attention in the practice of midwifery; for thus we may make a favourable change in the direction of the axis of the pelvis, relatively to that of the trunk, to that of the uterus, and in the direction of the expulsive forces of the latter, which may be rendered more or less efficacious according to circumstances, by making the woman preserve a proper attitude

"The junction of the coccyx with the sacrum permits the former to move, and yield to the different degrees of pressure it undergoes in different circumstances. The mobility is very great in youth; but diminishes insensibly as the patient grows older, and at last is totally lost. If entirely lost, or considerably diminished, before a woman is past child-bearing, it produces sometimes, though very rarely, an obstacle to delivery. The connections of the pelvis with the inferior extremities are not of much importance in midwifery. The natural course of labour cannot be disturbed by any fault in their configuration when the pelvis itself is well formed; but in general they are consequences of a deformity of it. They are *enarthroses*, which allow of motion in every direction."

The pelvis is divided into two parts, called the *upper* and *lower*, by a ridge sometimes elliptical, and sometimes of other shapes. The breadth of the upper part from the anterior superior spine of one ilium to another, is usually eight or nine inches, and its depth from three to four. At the back part of it is the projection of the lumbar vertebræ, and at the sides the *iliac fossæ*. The lower part forms a kind of canal, whose entrance and outlet are somewhat narrower than the middle; whence it has been distinguished into the *superior* strait, the *inferior* strait, and an excavation.—The *superior* strait is a kind of circle forming the entrance of the canal; its form, however, is various, as is also its obliquity from behind forwards. M. Levret has fixed this last at an angle of from 35 to 40 degrees.

The smallest diameter of this strait is generally about four inches, extending from the middle of the projection of the sacrum to the superior and internal part of the symphysis of the pubes. The other diameter

Description of the Pelvis in general.

diameter is usually about an inch longer, extending from one side of the strait to the other. The oblique diameters are a medium betwixt the two former, extending diagonally from each acetabulum to the sacro-iliac junction of the opposite side. The pelvis is cut at right angles by the two former, and into acute ones by the latter; but the diameters, considered in relation to delivery, are somewhat different from those just mentioned, some changes in them being occasioned by the soft parts within the pelvis.

The inferior strait is in general smaller, and of a more irregular figure than the other, being not formed like it entirely of bones. The edge, rendered unequal by three deep and large notches, is completed behind and at the sides by the sacro-ischiatic ligaments, forming a kind of circular notch before, called the *arch of the pubes*. The diameters of it are commonly about four inches in length; and though the transverse, which extends from one *ischium* to the other, be often a little longer than that which extends from the fore to the back part, it must be reckoned the smallest with regard to delivery; because the latter augments in proportion as the point of the coccyx recedes from the pubes. We must also remember, that the great diameter of the inferior strait is parallel to the smallest of the superior, and that it crosses the longest of that strait at an angle more or less acute; and by carefully attending to this, we may, in many cases, with the finger alone, when properly directed, remove obstacles which could not have been overcome even by means of instruments, without exposing the child to great inconveniences. It is likewise favourable to delivery that the middle part of the pelvis is a little larger from before backwards than the straits; which disposition proceeds from the curved figure of the *os sacrum*.—On one side this curve diminishes the numerous and long-continued frictions which the child's head would necessarily undergo if the pelvis were equally broad in all its parts; and on the other side it is equally useful in preventing the effects of a long and forcible pressure on the sacral nerves, which a flat form of the sacrum would have rendered unavoidable during the whole time of the passage of the head. The cavity of the pelvis is commonly from four to five inches deep behind, three and an half at the sides, and one and an half at most before.

The arch of the pubes, which at the top is only from one inch and a quarter to one and two-thirds in breadth, augments gradually as it descends; so that at the bottom its sides are three inches and an half, or even four inches, separated from one another; that is, if we take the line which is looked upon as the transverse diameter of the inferior strait for its base; the height being about two inches.

The axis of the superior strait of the pelvis cannot well be determined; but that of the inferior one, with regard to delivery, must be considered as passing through the centre of the opening of the vagina dilated by the child's head. Its direction is then so much inclined from behind forward, that its superior extremity traverses the lower part of the first falſe vertebra of the sacrum, and crosses that of the other strait at a very obtuse angle.

3

Hitherto we have treated only of that form of the pelvis which is most favourable for delivery: but the proportions and forms of it are various; and as it differs from those above described, the delivery is attended with more or less difficulty.

The defects of the pelvis, with regard to facility of delivery, consists in its being either too large or too small. At first sight it might be imagined, that a large pelvis would make the delivery more easy, as the head of the child will thus be exposed to fewer frictions, be more easily expelled, and the labour be less painful. But women who have a very large pelvis, are subject to those inconveniences which arise from an obliquity of the uterus, or even to a descent of it altogether; especially in the time of labour, when that viscus, being already charged with the weight of the child, is entirely subjected to the expulsive power of the abdominal muscles. In women who have had several children, the uterus is but weakly retained by its ligaments; and in subsequent pregnancies it descends still lower, until at last it rests on the margin of the pelvis. This, however, does not take place before the conclusion of the first four or five months: before that time its weight lies principally on the extremity of the rectum; and by this, as well as by its bulk, the discharge of the urine and fæces is impeded, and accidents sometimes ensue from the compression of the veins which pass through the pelvis. These symptoms sometimes vanish about the middle of pregnancy, but re-appear towards the latter end; because the head of the child is early engaged in the pelvis, and acts on the same parts that the whole uterus did before. Besides all these accidents, there are others which may take place at the time of delivery; so that, upon the whole, it cannot be reckoned any real advantage for a woman to have a large pelvis.

The accidents, however, which arise from too great a size of the pelvis, are much more easily remedied, and in themselves less dangerous, than such as arise from its narrowness. This defect may be considered as either relative or absolute. The former arises from an excess of size in the head of the child; the latter from a bad conformation of the pelvis itself. The absolute narrowness of the pelvis rarely affects all parts of it at once: it is generally found only in one of the straits; in which case, the other is usually of the natural size, nay, sometimes even larger than natural. The fault is more frequently in the superior than the inferior strait; and it is remarkable, that it most commonly affects the strait in its small diameter; very rarely in its transversal; sometimes affecting only one side. In the inferior strait it is generally caused by the approximation of the tuberosities of the ischia.

"It is easy (says M. Baudelocque) to determine why the superior strait is more frequently deformed than the inferior; and why it is almost always between the pubes and sacrum that it is defective respecting delivery. If we consider the direction of the forces which act on the pelvis of rickety children, in whom the bones are at the same time softer and more loosely connected than in the natural state, we shall see, that the greater part of those forces tend to carry the base of the sacrum forward and the *ossa pubis*

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pubis backwards. Whether the child be ftanding or fitting, if we attend to the direction of the fpinal column, we fhall fee that the weight of the body muft infenfibly pufh the bafe of the facrum towards the pubes; and that it acts in the fame manner on the inner parts of the acetabula, which ferve as a fulcrum to the inferior extremities when the child is ftanding or walking. The *offa pubis*, particularly in thefe latter cafes, muft be pufhed towards the facrum; in fuch a manner, however, that their pofterior extremities often approach a little nearer to the projection of the bafe of that bone than their anterior extremities, or the fymphyfis. If the fuperior ftrait does not conftantly prefent the fame figure in deformed *pelvifes*; if it is fometimes larger on one fide than the other; if one of the acetabula is nearer to the facrum, while the other approaches lefs; if the fymphyfis of the pubes is removed, in many cafes from a line which would divide the body into two equal parts—it is becaufe the rickets have not equally affected all the bones of the pelvis, nor equally hurt all their junctions; and becaufe the attitude which the child takes in walking or fitting may change a little the direction of the compreffing powers juft mentioned. The weight of the body may alfo equally hurt the form of the inferior ftrait, but varioufly, according to the moft ufual attitude of the child and the direction taken by the fpinal column. For example: If it fits much, the facrum will be more curved, and the ftrait more contracted from before backwards: in this attitude, if it inclines habitually to one fide, one of the ifchiatic tuberofities will be thrown inwards, the *os ilium* will be more elevated, &c. The action of the mufcles which are attached to the pelvis, the preffure of cloaths, and that which the arms of the nurfe exert on this part, contribute alfo fomething to the deformities in queftion, but much lefs than the weight of the trunk: whence we fee, of what importance it is to keep rickety children in bed, and leave them at liberty; inftead of obliging them to walk, to fit up, or have them conftantly in the arms, as is done almoft every where."

The dimenfions of the pelvis itfelf vary no lefs than the contour of the ftraits. If the diameter of fome, taken from the pubes to the middle of the projection of the *os facrum*, be only a few lines; in others the defect is feveral inches, fo that fcarcely a fingle inch is left between thefe bones. Thefe extremes, however, are not frequently met with; and the latter of them is never fo great in the inferior as in the fuperior ftrait. On comparing the dimenfions of a well-formed pelvis with thofe of a child's head, we fhall find that the former might admit of being fome inches lefs in circumference, and yet be large enough for an eafy delivery. The circumference of a common head is ufually no more than ten inches and a quarter, or ten and an half. The firft degree of narrownefs in any pelvis therefore muft be, when each diameter is fomething lefs than three inches and an half. M. Baudelocque fays, that he has feen pelvifes in which the diftance of the pubes from the facrum fuperiorly was no more than fix or eight lines; and he had in his poffeffion two others, in one of which the diftance from the back of the right acetabulum to the projection of the facrum was only three or four lines, and the other had but 14 lines between that projection and the fymphyfis of the pubes.

The narrownefs of the pelvis is to be accounted one of the principal caufes of difficult delivery.—When an opening of only three inches and a quarter is left, the labour muft be more difficult than when it is three inches and an half, as the number of frictions which the child's head muft undergo are then more numerous and frequent. When there is an opening only of three inches, the labour muft be ftill more difficult; but ftill there are inftances of natural deliveries without any affiftance, notwithftanding the difproportion betwixt the fize of the child's head and pelvis. This may even happen when the diameter of the pelvis is ftill fmaller, fuch as two inches and three quarters, or two and an half. M. Solayres obferved in a cafe of this kind, that the head was lengthened in fuch a manner, that its longeft diameter was eight inches all but two lines, that which goes from one parietal protuberance to the other being reduced to two inches five or fix lines; and M. Baudelocque has obferved fimilar changes in the form of the head, and the refpective lengths of its diameters at the inftant of birth, where the child was equally deformed, the long diameter being feven inches, and the tranfverfe one two inches fix or feven lines. The children were in good health; and the day after their birth their heads wanted very little of the ufual proportions.

But when the fmall diameter of the pelvis is lefs than two inches and an half, the head of the child cannot pafs; and then fome of the dangerous chirurgical methods muft be undertaken, which frequently prove fatal both to the mother and child. Even when the pelvis is two inches and an half in diameter, the natural delivery is not always without danger to both; as, on one hand, the foft parts which cover the pelvis are fubjected to fuch violent preffure that they become inflamed, exquifitely painful, and at laft are even threatened with gangrene; on the other, the bones of the child's cranium riding over one another, or fometimes fractured and depreffed, wound the brain, and produce internal extravafations which generally prove fatal. The bad confequences refulting from a deformed pelvis, fhow themfelves fooner or latter, according as the fuperior or inferior ftrait is vitiated. When both are fo, the obftacles to the birth begin to manifeft themfelves as foon as the labour begins; and fometimes thofe at the fuperior ftrait are fo great, that the expulfive powers are exhaufted, and the head ftops there; or if it be pufhed farther into the pelvis, and ftopping there, it will remain incapable of being delivered without the affiftance of art. The head cannot pafs this ftrait without being in a confiderable degree elongated; and when it enters the pelvis, the cavity being there fufficient for it, it naturally returns to its former dimenfions, at leaft in part, and more or lefs fo as it ftays a longer or fhorter time. The fame conformation of the head, however, which enabled it to pafs the firft ftrait, is ftill more neceffary to enable it to pafs the fecond: and hence the fymptoms which had come on with the firft pains, fometimes difappear in a great meafure during the time that the head ftays in the excavation; but increafe to a

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a greater degree than ever when the strong labour comes on.

When the superior strait alone is contracted, the head advances at first with great difficulty; but as soon as the parietal protuberances have cleared the strait, the other parts of the pelvis being relatively or absolutely larger, the head passes them with so much ease, that the delivery is frequently terminated by a few pains. The contrary is observable when the fault is in the inferior strait, if the first be of the usual size. The head then descends easily into the lower part of the pelvis; but cannot proceed any farther, until it overcome the obstacles which obstruct its course, and render it difficult and laborious. In this case, the symptoms attending obstruction appear later than in the former. In these cases, however, it is necessary that the practitioner should accustom himself by practice to form a just estimate of the powers of nature, otherwise he may easily deceive himself; in the former, supposing that a delivery is impossible; and in the latter, that a delivery will be easy which cannot be effected without the assistance of art. An instance of this is given by our author, in a case to which (he says) more than forty persons were witnesses.

The operator pronounced that the woman would be speedily delivered, on account of the facility with which the child's head had engaged with the first pains; and attributing the obstacles which soon after obstructed its course to another cause, rashly destroyed the child by using the crotchet, when its life might have been preserved by other means, having waited two days in blind security, expecting a natural delivery. M. Baudelocque obtained possession of the pelvis of this woman after she died; and tells us, that the circumference of the superior strait of the pelvis, when divested of all its coverings, measured 14 inches, but the inferior only *nine*. The distance from the point of the os sacrum to the symphysis of the pubes, as well as the interval between the ischiatic tuberosities, was but three inches. The cavity of this pelvis diminished insensibly in breadth from one strait to the other, and was as regular as possible in its contour.

The excavation, or middle part of the pelvis, is much more seldom defective in its form than the straits; and when this is the case, it must arise from some exostosis, or from the sacrum describing a right line in its anterior part, instead of being curved as usual. The straight and flat form of the sacrum generally produces fewer obstacles to delivery than the too great curvature of it. The former fault generally affects only the cavity of the pelvis, and cannot hinder the passage of the child, if the canal be otherwise well disposed: but the latter, or too great a curve of the sacrum, commonly proves injurious to both straits, contracting them from before backwards, and at the same time diminishing the depth of the pelvis at the back part, as well as the respective height of the arch of the pubes. In these cases the head, though it passes the first strait with difficulty, cannot pass the second; being stopped in its course by the inferior part of the sacrum before the occiput is long enough to engage under the arch.

Labours may also be rendered difficult by too great a length of the symphysis of the pubes; a want of elevation, or breadth of the arch of these bones; the length and wrong direction of the ischiatic spines, as well as a consolidation of the coccyx with the point of the sacrum. These faults, however, are very rare, if we except the consolidation of the coccyx: they are scarce ever met with alone, and are generally the consequences of a bad conformation of the rest of the pelvis. Even this consolidation, however, though more common than the other faults, yet cannot obstruct delivery so frequently as has been imagined; and when it does so, it is only in women who have a narrow pelvis. Our author denies the position laid down by some, that the head of the child, in all cases, pushes back the point of the coccyx half an inch, or even a whole inch. Those who assert this (he says) know not the relation betwixt the dimensions of the head and the inferior strait in most women. Whence he cannot recommend a precept founded upon this principle, by which it is directed to push back the coccyx, when the head, though low down, cannot disengage itself easily.

We must now consider a subject on which the writers upon midwifery have been greatly divided, viz. the separation of the bones of the pelvis in the time of labour. Some have imagined that this separation took place in all labours; others that it happened only in difficult cases; some, that it indicates a morbific state; and some that it was quite impossible.—M. Baudelocque allows the possibility of such a separation, but denies that it happens so frequently as is imagined. "Experience (says he) demonstrates, that this separation, far from being common, is very rarely met with, and is not more usual after a laborious than after an easy labour, nor in a distorted pelvis than in one well formed. I have sought for it twenty times in all these cases, by opening the bodies, and have scarcely met with one which could remove all doubt of its existence." In those cases where it takes place, he is of opinion, that the filtration of serum into the ligamentous tissue of the symphysis, must be regarded as the usual predisposing cause. The remote cause, of consequence, must be whatever produces this filtration. This, he thinks, cannot be done merely by the pressure of the gravid uterus on the trunks of the vessels which are distributed to these symphyses. An alteration in the fluids themselves he supposes likewise to be necessary.

But though the predisposing cause of this separation must be the relaxation of the symphyses by the infiltration of serum, we are not to look upon the swelling of the cartilages by means of this infiltration to be the immediate cause: For however the ligaments may be relaxed, the cartilages which incrust the extremities of the ossa pubis, as well as the articular facettes of the ossa ilia and the sacrum, are no thicker; so that they cannot, as some have supposed, act like wetted wedges by which large blocks of stone may be cleaved. "The wedge by which the bones of the pelvis are separated (says our author), does not act between the extremities of these bones, but in the circle formed by their assemblage in the pelvis itself: it is the uterus charged with the produce of concep-

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tion in the latter periods of pregnancy, and the child's head forced down by the action of the uterus, and of the abdominal muscles in time of labour."

This separation, however, is not always the effect of a relaxation and stretching of the ligamentous tissue of the symphysis. In some cases, where the obstacles which obstruct the passage of the child are very great, and the efforts for its expulsion very strong and lasting, the symphyses tear, and permit the bones to separate much farther than they could have done by a simple relaxation. "I must add (says our author) that it is not the symphysis of the pubes, properly speaking, which tears; for no effort can break the ligamentous substance which unites these bones to each other; the symphysis detaches itself from one of them, and leaves the bone naked." The separation in question has likewise frequently taken place in instrumental deliveries, to which the natural efforts seemed to contribute nothing; and it has also been found in consequence of a stroke or fall.

"Being deceived in the principle of this separation (says M. Baudelocque), they necessarily erred in the consequence deduced from it. It has been so firmly believed to take place in all labours, that it was thought to be absolutely necessary; and that without it many women could not be delivered without extreme difficulty. Having thus mistaken the necessity and pretended advantages of this separation, the natural resistance of the symphyses, and above all the dryness and rigidity necessarily induced in them by age, were consequently reckoned among the causes of difficult and laborious births. Obstacles have been attributed to the state of these symphyses, which merely depended on the resistance of the neck of the uterus, and of the external parts; and it has been recommended to moisten and relax them by the use of baths, cataplasms, lineaments, fomentations, &c. But what can be expected from such methods, when delivery is obstructed by a narrow pelvis? Will any one venture to assert, that he has once by such means obtained the effect he expected, and that he has thus assisted labours which could not otherwise have been terminated but by the Cæsarean operation, as has so often been published? I should have dispensed with demonstrating the fallacy which has prevailed on this point, if it had not led some practitioners into a very serious consequence. In order to appretiate all these means, and fix the degree of confidence to be placed in them, supposing that they could operate to the relaxation of the symphysis of the pelvis, it is necessary to determine what degree of amplitude can be given to that cavity by the separation of the bones which constitute it. The ossa pubis cannot separate without augmenting the circumference of the pelvis; but how much will its diameter be increased? If the circumference were perfectly circular, every possible diameter would partake a third of that augmentation: but as the entrance of the pelvis is in general the more elliptic as it deviates more from its natural state, it follows, that its different diameters cannot increase in the same proportion; and we may say that there is none but the transverse one which can become larger. In a moderate separation the *antero-posterior* diameter is scarce at all augmented; and it has been repeatedly demonstrated, that the ossa pubis must separate at least an inch to procure two lines in that direction; while the transverse diameter shall be increased six lines, and often more.

"The pelvis being larger in most women than is necessary for their delivery, the separation of the bones could be of no advantage to them, nor render their delivery more easy. Far from regarding it, with some ancient authors, as a benefaction of nature, we ought to consider it as an additional source of inconveniences in those women who are subject to it: for, on one side, we see that a pelvis too large exposes the woman to a number of accidents; and on the other, that there are some which inevitably accompany the separation, and the mobility of the bones which form that cavity. Far from favouring delivery in all these cases, it could not but render it more tedious and painful to the woman, as experience has convinced me. If we ought to expect any real advantage from it, considering it only with respect to the passage of the child, it could only be in those women who have the pelvis deformed, and where the defect which rendered delivery impossible did not exceed two lines at the most; since a separation of an inch cannot procure an augmentation of more than two lines in the small diameter of the superior strait, which is almost always that which occasions the greatest obstacles to the exit of the child. If from a separation of an inch, which has never taken place between the ossa pubis without a rupture of their symphysis, we are not to expect an augmentation of more than two lines in the direction of the little diameter of the superior strait, what can we obtain from a separation always much less, and so little apparent in most women that we may doubt its existence? The examination of a great number of women who have died in child-bed, has proved to me that it is excessively rare for the separation in question to amount to two lines; and I never found it exceed that but once. But supposing (what is impossible) that art could procure a separation of an inch between the ossa pubis without dividing their symphysis, what practitioner would dare to affirm, without fear of being deceived, that the volume of the child's head did not exceed the little diameter of the superior strait by more than two lines? If it is difficult to estimate justly the degree of opening in the pelvis, it is much more difficult still to judge of the child's head; and it is only by taking the mean between the largest and the smallest that we usually establish the relation of its dimensions to those of the pelvis; but a *thereabouts*, in the case supposed, cannot supply the place of that precision which would be necessary."

From his reasoning upon this subject, M. Baudelocque concludes directly against the operation of cutting the symphysis of the pubes, as being not only useless, but attended with very dangerous consequences. "When this separation (says he) has been suddenly made, severe pains in the parts divided, an impossibity of walking, and sometimes even of moving the inferior extremities, inflammation, fever, abscesses, caries, and lastly death itself, have generally been the effects of it: but when a relaxation only takes place, the consequences are less severe; a painful and tottering walk being the only symptom attending it. If the relaxed symphysis at last grow firm again, if the bones of the pelvis recover their former stability, if the

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the lamenefs goes off entirely in fome women, how often, on the contrary, have we not obferved an inability to walk, or even to move the legs, without violent pain, continue for years afterwards?"

Thefe violent fymptoms frequently attend even flight feparations of the bones in queftion. M. Baudelocque gives an inftance of a woman who had kept her bed ten months, being all that time afflicted with the moft excruciating pains in the junction of the offa pubis, and of one of the ilia, with the facrum, whenever fhe attempted to move the inferior extremities, though no feparation of the fymphyfis could be difcovered, nor any thing befides a flight mobility in that of the pubes. The accident had been perceived during the time of labour, and the midwife had been accufed of luxating the bones.

Dr Denman has alfo treated this fubject at confiderable length. He informs us, that for many centuries it was believed that thefe bones were always feparated during the time of labour; or that there was a difpofition to feparate, and an actual feparation, if the neceffity of any particular cafe required that enlargement of the cavity of the pelvis which was confequent to it. The degree of feparation was alfo fuppofed to be proportioned to fuch neceffity; and when this did not happen naturally, inftruments were made ufe of for diftending the parts: and, on the fame principle, the fection of the fymphyfis of the pubes has been recommended. "This opinion (fays he) ought probably to be affigned as one reafon for the fuperficial notice taken by the early writers on midwifery of thofe difficulties which are fometimes found to occur in parturition from the narrownefs or deformity of the pelvis. To this may alfo be referred much of the popular treatment of women in child-bed, and many popular expreffions in ufe at prefent. But this opinion has been controverted by many writers, who affert, that there was neither a feparation nor a difpofition to feparate; but that, when either of them did happen, they were not to be efteemed as common effects attendant on the parturient ftate, but as difeafes of the connecting parts. The difputants on each fide have appealed to prefumptive arguments, and to facts proved by the examination of the bodies of thofe who died in child-bed, in juftification of their feveral opinions. But, notwithftanding all that has been faid, I know not that we are authorifed by the experience of the prefent time to fay, that a feparation, or a difpofition to feparate, prevails univerfally at the latter part of pregnancy, or at the time of labour: yet that thefe effects are often, if not generally, produced, may be gathered from the pain and weaknefs at the parts where the bones of the pelvis are joined to each other before and after delivery. In fome cafes alfo pregnant women are fenfible of a motion at the junction of the bones, efpecially at the fymphyfis of the offa pubis; and the noife which accompanies it may fometimes be heard by the byftanders.

"A ftrong prefumptive argument in favour of the feparation of the bones has been drawn from quadrupeds. In thefe the ligaments which pafs from the obtufe proceffes of the ifchia to the facrum, on which the firmnefs of the junction of the bones very much depends, and which at all other times refift any impreffion attempted to be made upon them, are for feveral days previous to parturition gradually deprived of their ftrength, and the animal walks in fuch a manner as would incline us to believe could only be produced by a feparation of the bones of the pelvis. Now it is not reafonable to conclude, that a circumftance which generally takes place in one clafs of viviparous animals fhould never occur in another, efpecially in a matter in which there is not effential difference."

Notwithftanding thefe arguments, however, Dr Denman does not look upon the matter to be yet abfolutely decided. No perfon, he fays, who has been converfant in the diffection of women who have died in child bed, can have wanted opportunities of feeing every intermediate ftate of thefe parts, from a feparation in which the furfaces of the bones were loofened and at a confiderable diftance from each other, to that in which there was not the leaft difpofition to difunite.

When this feparation takes place beyond a certain degree, it is to be looked upon as morbid: and, he fays, that it may be produced by the two following caufes. "*1ft*, A fpontaneous difpofition of the connecting parts. *2dly*, The violence with which the head of the child is protruded through the pelvis." Of each of thefe cafes he gives an example.—The firft was of a young lady of a healthy conftitution, who had been married in the 21ft year of her age, and in 1774 was delivered of her third child, which was unufually large, and the labour was fevere and tedious. For feveral days before delivery fhe had been fo much afflicted with pain and weaknefs in her loins, that fhe could not walk without affiftance. She recovered without any unfavourable circumftance, excepting that for feveral weeks fhe was incapable of ftanding upright, or putting one foot before the other; the attempt to do either being attended with pain and a fenfation of loofenefs and jarring, both at the parts where the offa innominata are joined to the facrum, and at the fymphyfis of the offa pubis. By the ufe of ftrengthening medicines fhe recovered, and in a few months was perfectly well."

It being fufpected that the complaints above mentioned had proceeded from too frequent parturition, fhe was advifed to fuckle her child for a longer time than ufual; and accordingly continued a nurfe for 15 months. Soon after this fhe became with child a fourth time. The complaints which had accompanied her former pregnancy now came on fooner, and with greater violence than before, infomuch that for three weeks before delivery fhe could neither walk nor ftand; and there was reafon to fuppofe that the bones of the pelvis were feparating. She was delivered on the 7th of July 1777, the labour being accompanied with faintings, great irritability, and a total inability to move her inferior extremities. A few days after her delivery fhe had a fever, which terminated in an abfcefs in one of her breafts, by which fhe was confined to her bed for near feven weeks. In nine weeks fhe could walk with crutches, and received confiderable benefit by being fent into the country; and likewife, as fhe imagined, by drinking half a pint of infufion of malt twice a day. In about five months fhe was able to walk without affiftance; though fometimes fenfible of

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of the motion of the bones, which seem never to have been perfectly united.

About Christmas the same year, this lady became again pregnant; and in the month of July 1778 she began to feel an inability to move; which, however, was attributed to the heat of the weather: but on a sudden the pain and weakness of her back returned to such a degree, that she could walk no more till the 11th of October, when she was delivered of a fine child, but after a most severe and tedious labour, occasioned in a great measure by her being totally unable to move. The symptoms after her delivery became very extraordinary and alarming. On the fourth day a fever came on; and though this was soon removed, the pain at the junction of the bones still continued. She had no command of her inferior extremities; and the pain, when she was moved, became so excruciating, that she felt as if tearing asunder. Her stomach was at all times much disturbed; but when the pain became violent, a nausea, vomiting, or hiccough came on. Strange sympathies were produced in various parts; as a teasing cough, sneezing, sense of weight in her eye-lids, which could not be kept open though there was no inclination to sleep. There was a noise in the bowels, and other nervous affections, all of which ceased when the pain was allayed by opiates.

Having remained for several months in this deplorable situation, it was at last thought proper to raise her from her bed, and cause her to make an effort to stand or walk, lest her complaints should be made worse by such a long course of inactivity. She had now, however, totally lost the power of supporting herself; the motion of the bones was plainly perceived; and the consequences of every trial were so painful, that there was a necessity for desisting. In 1779 she was removed, upon a couch, in a boat to Margate, for the benefit of the air and sea-bathing, from which she was always sensible of receiving advantage. In this place she continued to reside; and in *eight years* after her delivery became able to walk without crutches.

The second case was of a young woman of a healthy but delicate constitution, who was in labour of her first child. The pains were so strong, that the head of the child was forced through the external parts, and the perinæum supposed to be lacerated, in spite of all the opposition which could be made. At the instant when the head of the child was expelled, the operator perceived something to jar under his hand, and was even sensible of a noise, which he attributed to the laceration of the perinæum. In a little time the placenta was extracted without hurry or violence; and a few drops of *tinctura opii* were given to allay the uneasiness which took place, and was supposed to be occasioned by *after pains*. On the following days, however, she complained of an uneasiness in the region of the abdomen; but no particular notice was taken of it, as the milk was regularly secreted, and there was no symptom of fever; but on the fourth day, when taken out of bed, she was found to be unable either to stand or sit on her chair by reason of the pain and weakness in the part of which she originally complained. This was afterwards conjectured to arise from a separation of the bones of the pubes; to which conjecture the long continuance of the complaint seemed to give countenance. The conjecture was founded on the positions and attitudes in which the patient sought to find relief. The symptoms were as follow:—When she endeavoured to stand upright, which she could do better upon one foot than both, and with her feet close than at a distance, together with the pain at the symphysis, she had a sense of extreme weakness, accompanied with a faintness. When she first sat down on her chair, resting her elbows upon the arms, the complaints became tolerable. When she had remained a little time in this position, they again became importunate, and she supported herself with her hands upon her knees, and presently bent forwards, so as to lean her elbows upon her knees: this position becoming irksome, she was obliged to return to her bed, where she became immediately easy. When she first attempted to walk, she was compelled to bend forwards in such a manner as to rest her hands upon her knees, making a straight line from her shoulders to her feet. At the end of 14 weeks, whilst she was in a coach, into which she had often been lifted for the benefit of air and exercise, she had a discharge which she supposed to be menstruous; but which, though it ceased before her return, gave immediate relief. From this time she became better every day, and in six weeks was able to walk. She had afterwards three children, with which her labours were easy, and she never had any return of the above mentioned complaints.

From all this it is evident, that Dr Denman differs considerably in his opinion from M. Baudelocque concerning the separation of these bones. According to him, it appears that this separation, though extremely painful, does not seem to be attended with *fatal* consequences; and with regard to the *quantity* of the separation, it must undoubtedly be sometimes much greater than what M. Baudelocque supposes; for Dr Denman brings an instance from the 484th number of the Philosophical Transactions, in which the bones were separated to the distance of *four inches*. This happened in consequence of the starting of a horse when a gentleman was riding. He observes, however, that, in women, the violence which the connecting parts of the bones undergo when the head of the child is protruded through the pelvis with extreme difficulty, sometimes occasions an affection of more consequence than even the separation of the bones themselves. This is the formation of matter upon the loosened surfaces of the bones, preceded by great pain, and other symptoms of inflammation.

In the beginning of this complaint, it is difficult to ascertain whether the connecting parts of the bones, or some of those contiguous, be the seat of the disease; but when suppuration has taken place in consequence of the injury sustained at the junction of the ossa innominata with the sacrum, the abscess has sometimes been cured by the common treatment, having formed in the neighbourhood of the injured part. At other times, when matter has been formed about the symphysis of the os pubis, hectic symptoms have ensued, and the cause of them only discovered after the patient died. In some cases the matter has burst through the capsular ligament of the symphysis at the inferior edge, or perhaps made its way into the bladder; and in

Description of the Pelvis in general

in others it has insinuated itself under the *periosteum*, continuing its course along the pubes, until it arrives at the acetabulum. Thus all the symptoms were aggravated; and the matter making its way towards the surface, a large abscess has been formed on the inner or fore-part of the thigh, or near the hip; so that the patients have at last sunk under the fever and profuse discharge from the ulcer. On dissecting those who have died in this manner, the track of the matter has been followed from the aperture of the abscess to the symphysis, the cartilages of which were found to be eroded, the bones carious, and the adjacent parts very much injured or destroyed. Our author imagines it possible, by means of some particular symptom, to discover whether or not there be any disposition in the parts above mentioned to suppurate, or to know when suppuration has taken place. In all cases of unusual pain attended with equivocal symptoms, the parts ought to be examined with great care and attention: for where there is any disposition to suppurate, it might perhaps be removed by proper means; and when the matter is formed, if there be a swelling in the symphysis, and, more especially, if a fluctuation could be perceived, the propriety of making an incision to evacuate the matter, and prevent farther bad consequences, might be determined.

With regard to the possibility of re-uniting the bones of the pelvis after they have once been separated, our author has the following observations.

"When the connection of the bones of the pelvis has either been impaired or destroyed, it is probable that a confirmation or re-union may take place by a restoration of the original mode, by a callus, or by anchylosis. But it is likewise possible that the bones may remain in a state of separation, and an articulation be formed by the ends of each bone, at the symphysis of the ossa pubis, and at the junction of the ossa innominata with the os sacrum." Of this last the Doctor has seen one instance in a dead body, and has had reason to suspect the existence of it in some living persons. In the lower degrees of imperfection the former method of union probably takes place; as the complaints made by women of pain and weakness, after delivery, generally go off before their month of confinement is elapsed; but when they continue for a longer time, the best method is to enjoin the patient rest and an horizontal posture. In an increased degree of the complaint, where the health of the patient is affected, a longer time will be required for the recovery; but should the injury be too great to admit of the restoration of the original mode of union, a much longer time will be requisite for the formation of a callus, if this ever takes place except as a previous step to an anchylosis. This last has been observed frequently to take place at the junction of the ossa innominata with the sacrum, but never at the symphysis of the pubes. In this case little can be expected excepting from such remedies as tend to restore the constitution to its pristine vigour; and in the first case above related, the only thing from which the patient seemed to obtain relief was the cold-bath. She was likewise much assisted by the use of a swath, or broad belt, made of soft leather, quilted, and buckled with such firmness over the lower part of the body as to lessen, if not prevent, the motion of the bones; and this was kept in its situation by a bandage passed between the legs, from the hind to the fore part of the belt. But when a joint is formed between the separated surfaces of the bones, all hope of recovering the patient to her former health may be given up. The only thing which can then be done for her relief must be by the use of a belt, or some similar contrivance, to substitute, as much as possible, artificial firmness, instead of natural. Dr Denman saw one case in which he suspected this to have happened, and in which the life of the patient was truly miserable: He is of opinion, however, that it very rarely occurs; having been informed of another person, who, after eight years confinement to her bed, in consequence of the separation of the bones in the time of labour, was at last restored to the perfect use of her inferior extremities. Instances also, though rare, have occurred, in which women, after labours, have suffered much pain in the region of the sacrum, and totally lost the power of moving their inferior extremities.—This has been supposed a paralytic affection, and they are said to be bed-ridden; but as these patients have generally been restored, though after a very long confinement, our author thinks it reasonable to suppose that their infirmity had been occasioned by a separation of the bones, which at different periods after the accident, according to the degree of their separation, had recovered their former connection and strength.

Pregnancy.

Chap. II. *Of Pregnancy.*

At the time of conception, and for some time after, the parts which form the small fœtus are so blended together, that one cannot be distinguished from another. The whole mass is then called an *ovum*. This ovum consists of four membranes; the placenta, or after-birth; the funis umbilicalis or navel-string, leading to the child; and the surrounding watery fluid in which it floats. Before the child acquires a distinct and regular form, it is called *embryo*, and afterwards retains the name of *fœtus* till its birth. For the increase and nutrition of the fœtus, see Anatomy, n° 109. 110.

During the progress of impregnation the uterus suffers considerable changes; but, though it enlarges as the ovum increases, yet, in regard to its contents, it is never full; for, in early gestation, these are confined to the fundus only: and though the capacity of the uterus increases, yet it is not mechanically stretched, for the thickness of its sides do not diminish; there is a proportional increase of the quantity of fluids, and therefore pretty much the same thickness remains as before impregnation.

The gravid uterus is of different sizes in different women; and must vary according to the bulk of the fœtus and involucra. The situation will also vary according to the increase of its contents and the position of the body. For the first two or three months, the cavity of the fundus is triangular, as before impregnation; but as the uterus stretches, it gradually acquires a more rounded form. In general, the uterus never rises directly upwards, but inclines a little obliquely, most commonly to the right side; its position is never, however, so oblique as to prove the sole

cause

Pregnancy. caufe either of preventing or retarding delivery: its increafe of bulk does not feem to arife merely from diftention, but to depend on the fame caufe as the extention of the fkin in a growing child. This is proved from fome late inftances of extra-uterine fœtufes, where the uterus, though there were no contents, was nearly of the fame fize, from the additional quantity of nourifhment tranfmitted, as if the ovum had been contained within its cavity.

The internal furface, which is generally pretty fmooth, except where the placenta adheres, is lined with a tender efflorefcence of the uterus, which, after delivery, appears as if torn, and is thrown off with the cleanfings. This is the *membrana decidua* of Dr Hunter.

Though the uterus, from the moment of conception, is gradually diftended, by which confiderable changes are occafioned, it is very difficult to judge of pregnancy from appearances in the early months. For the firft three months the os tincæ feels fmooth and even, and its orifice as fmall as in the virgin ftate. When any difference can be perceived, about the fourth or fifth month from the defcent of the fundus through the pelvis, the tubercle or projecting part of the os tincæ will feem larger, longer, and more expanded; but, after this period, it fhortens, particularly at its fore-parts and fides, and its orifice or labia begin to feparate, fo as to have its conical appearance deftroyed. The cervix, which in the early months is nearly fhut, now begins to ftretch and to be diftended to the os tincæ; but during the whole term of utero-geftation, the mouth of the uterus is ftrongly cemented with a ropy mucus, which lines it and the cervix, and begins to be difcharged on the approach of labour. In the laft week, when the cervix uteri is completely diftended, the uterine orifice begins to form an elliptical tube, inftead of a fiffure, or to affume the appearance of a ring on a large globe; and often at this time, efpecially in pendulous bellies, difappears entirely, fo as to be out of the reach of the finger in touching. Hence the os uteri is not in the direction of the axis of the womb, as has generally been fuppofed.

About the fourth, or between the fourth and fifth month, the fundus uteri begins to rife above the pubes or brim of the pelvis, and its cervix to be diftended nearly one third. In the fifth month the belly fwells like a ball, with the fkin tenfe, the fundus about half way between the pubes and navel, and the neck one half diftended. After the fixth month the greateft part of the cervix uteri dilates, fo as to make almoft one cavity with the fundus. In the feventh month the fundus advances as far as the umbilicus. In the eighth it reaches mid-way between the navel and fcrobiculus cordis; and in the ninth to the fcrobiculus itfelf, the neck then being entirely diftended, which, with the os tincæ, become the weakeft part of the uterus. Thus at full time the uterus occupies all the umbilical and hypogaftric regions; its fhape is almoft pyriform, that is, more rounded above than below, and having a ftricture on that part which is furrounded by the brim of the pelvis.

The appendages of the uterus fuffer very little change during pregnancy, except the ligamenta lata, which diminifh in breadth as the uterus enlarges, and at full time are almoft entirely obliterated.

The moft remarkable change happens in the ovarium. A cicatrice of a roundifh figure and yellowifh colour appears in this body, called by anatomifts the *corpus luteum*. It is always to be found in one of the ovaria; and in cafes of twins a corpus luteum often appears in both ovaria. It was formerly confidered as the calyx ovi; but modern phyfiologifts think it a gland, from whence the feminal fluid is ejected. In early geftation it is moft confpicuous, when a cavity is obfervable, which afterwards collapfes; no veffels appear at the centre of this cavity which has the appearance of cicatrix, but all around that centre the fubftance is vafcular.

During the progrefs of diftenfion, the fubftance of the uterus becomes much loofer, of a fofter texture, and more vafcular than before conception; its veins particularly, in their diameters, being enlarged in fuch a manner as to get the name of *finufes;* they obferve a more direct courfe than the arteries, which run in a ferpentine manner, anaftomofing with one another and through its whole fubftance, efpecially where the placenta adheres, where this vafcular appearance is moft confpicuous.

The arteries pafs from the uterus through the decidua, and open into the fubftance of the placenta in a flanting direction. The veins alfo open into the placenta, and by injecting thefe veins from the uterus with wax, the whole fpungy or cellular part of the placenta will be filled.

The mufcular ftructure of the gravid uterus is extremely difficult to be fhown: in the wombs of women who die in labour, or foon after delivery, fibres running in various directions are obfervable more or lefs circular, that feem to arife from three diftinct origins; viz. from the place where the placenta adheres, and from the aperture or orifice of each of the tubes; but it is almoft impoffible to demonftrate regular plans of fibres, continued any length without interruption.

Chap. III. *Spurious Gravidity.*

Spurious Gravidity. The various difeafes incident to the uterine fyftem, and other morbid affections of the abdominal vifcera, will frequently excite the fymptoms and affume the appearance of utero-geftation. Complaints arifing from a fimple obftruction are fometimes miftaken for thofe of breeding; when a tumor about the region of the uterus is alfo formed, and gradually becomes more and more bulky, the fymptoms it occafions are fo ftrongly marked, and the refemblance to pregnancy fo very ftriking, that the ignorant patient is often deceived, and even the experienced phyfician impofed on.

Scirrhous, polypous, or farcomatous tumors in or about the uterus or pelvis; dropfy or ventofity of the uterus or tubes; fteatoma or dropfy of the ovaria, and ventral conception, are the common caufes of fuch fallacious appearances.. In many of thefe cafes the menfes difappear; naufea, retchings, and other fymptoms of breeding, enfue; flatus in the bowels will be miftaken for the motion of the child; and in the advanced

Superfœtation.

vcnced ſtages of the diſeaſe, from the preſſure of the ſwelling on the adjacent parts. Tumefaction and hardneſs of the mammæ ſupervene, and ſometimes a viſcid or ſerous fluid diſtils from the nipple; circumſtances that ſtrongly confirm the woman in her opinion, till time or the dreadful conſequences that often enſue at laſt convince her of her fatal miſtake.

Falſe Conception.—Mola. Other kinds of ſpurious gravidity, leſs hazardous in their nature than any of the preceding, may under this head alſo be claſſed; diſeaſes commonly known by the names of *falſe conception* and *mola*: The former of theſe is nothing more than the diſſolution of the fœtus in the early months; the placenta is afterwards retained in the uterus, and from the addition of coagula, or in conſequence of diſeaſe, is excluded in an indurated or enlarged ſtate; when it remained for months or longer, and came off in the form of a fleſhy or ſcirrhous-like maſs, without having any cavity in the centre, it was formerly diſtinguiſhed by the name of *mola*.

Mere coagula of blood, retained in the uterus after delivery, or after immoderate floodings at any period of life, and ſqueezed, by the preſſure of the uterus, into a fibrous or compact form, conſtitute another ſpecies of mola, that more frequently occurs than any of the former. Theſe, though they may aſſume the appearances of gravidity, are generally, however, expelled ſpontaneouſly, and are ſeldom followed with dangerous conſequences.

Chap. IV. *Superfœtation.*

Soon after impregnation takes place, the cervix uteri becomes entirely ſhut up by means of a thick viſcid gluten: the internal cavity is alſo lined by the external membrane of the ovum, which attaches itſelf to the whole internal ſurface of the fundus uteri: the Fallopian tubes alſo become flaccid; and are, as gravidity advances, ſuppoſed to be removed at ſuch a diſtance, that they cannot reach the ovaria to receive or convey another ovum into the uterus. For theſe, and other reaſons, the doctrine of *ſuperfœtation* is now pretty generally exploded.—A doctrine that ſeems to have ariſen from the caſe of a double or triple conception, where, ſome time after their formation in utero, one fœtus has been expelled, and another has remained; or after the extinction of life at an early period, one or more may be ſtill retained, and thrown off in a ſmall and putrid ſtate, after the birth of a full-grown child.

The uterus of brutes is divided into different cells; and their ova do not attach themſelves to the uterus ſo early as in the human ſubject, but are ſuppoſed to receive their nouriſhment for ſome time by abſorption. Hence the os uteri does not cloſe immediately after conception; for a bitch will admit a variety of dogs while ſhe is in ſeaſon, and will bring forth puppies of theſe different ſpecies: thus it is common for a grehound to have, in the ſame litter, one of the grehound kind, a pointer, and a third, or more, different from both: Another circumſtance that has given riſe to *ſuperfœtation* in the human ſubject, which can *only* happen when there is a double ſet of parts, inſtances of which are very rare.

Chap. V. *Extra uterine Fœtuſes, or ventral Conception.*

Monſters.

The impregnated ovum, or rudiments of the fœtus, is not always received from the ovarium by the tuba Fallopiana, to be thence conveyed into the cavity of the uterus; for there are inſtances where the fœtus ſometimes remains in the ovarium, and ſometimes even in the tube; or where it drops out of the ovarium, miſſes the tubes, and falls into the cavity of the abdomen, takes root in the neighbouring parts, and is thereby nouriſhed: But as theſe fœtuſes cannot there receive ſo much nouriſhment as in the ſucculent uterus, they are leſs, and generally come to their full growth before the common term.

Of theſe ſome burſt in the abdomen; and others form abſceſſes, and are thereby diſcharged; others dry, and appear bony, and remain during life, or are diſcharged as above, or by ſtool, &c.

Chap. VI. *Monſters.*

When two or more ova contained in the uterus attach themſelves ſo near one another as to adhere in whole or in part, ſo as to form only one body with membranes and water in common, this body will form a confuſed irregular maſs called *monſtrous*; and thus a monſter may be either defective in its organic parts, or be ſupplied with a ſupernumerary ſet of parts derived from another ovum. This ſeems a rational conjecture; but while every thing relative to generation is a myſtery, how can we account for the extraordinary phænomena? Some authors enumerate a third ſpecies of monſter, the product of a mixed breed, exemplified, for inſtance, in the mule, produced by the mixed generation of an aſs and a mare. In this animal there are organical parts different from what preexiſted in the parents; there is a defect of ſome parts, a luxuriant growth of others; and the defect in the parts of generation, which renders the animal unfit for propagation, conſtitutes a very curious and particular ſpecies.

Chap. VII. *Diſeaſes of Pregnancy.*

After conception, a remarkable change is ſoon produced in the genital ſyſtem. This is the ſource from whence ariſe different ſymptoms that are however liable to conſiderable variation, not only in the conſtitution of different women, but in the ſame woman in different pregnancies, and at different periods of the ſame pregnancy.

Outlines of Midwifery, by Dr Hamilton.

Pregnancy,—though a natural alteration of the animal-œconomy, which every female ſeems originally formed to undergo, and hence not to be conſidered as a ſtate of diſeaſe, occaſions, however, ſooner or later, in many women, various complaints, which evidently depend on it as a cauſe.

Diſeaſes incident to the pregnant ſtate may be conſidered, either, 1. As ariſing from ſympathy in the early months; or, 2. As depending on the ſtretching and preſſure of the uterus towards the more advanced ſtages.

I. Though

Diseases of Pregnancy.

I. Though the former of these complaints are generally to be accounted for from other causes than that of plethora; yet, in many constitutions, a certain plethoric disposition in the early months of pregnancy seems to prevail in the vascular system: And therefore, though many inconveniences may ensue from a too frequent, a too copious, or an indiscriminate use of venesection; yet, if prudently and judiciously employed, abortion by this means will not be endangered, as some late authors have alleged; but, on the contrary, on many occasions, a seasonable bleeding will be attended with the most beneficial and salutary effects.

In young women, suddenly affected with severe sickness and loathing, febrile commotion, headach, vertigo, and other symptoms of breeding, more especially in full sanguineous habits, besides a spare light diet and suitable exercise, recourse must be had to proper evacuations, the chief of which is venesection: this may be safely performed at any time of gravidation, and occasionally repeated according to the urgency of the symptoms; small bleedings, at proper intervals, are preferable to copious evacuations, which in early pregnancy ought always to be carefully guarded against.

When the stomach is loaded with putrid bile or acrid saburra, the offensive matter should be discharged by gentle vomits of ipecacuan, or of infusions of chamomile flowers. The violent efforts to retch and vomit, and the commotions thence excited, which often occasion the expulsion of the fœtus, will by this means frequently be removed, in most cases greatly diminished. During the term of breeding, the state of the belly must be also attended to. When laxative medicines become necessary, those of the mildest and gentlest kind should be administered.

In women liable to nervous complaints, where the stomach is weak, and the sickness violent and continued, the patient should be put on a course of light, aromatic, and strengthening bitters; such as infusions of bark, columbo, &c. and her diet, air, exercise, company, and amusement, should be regulated: In order to settle the stomach, and lessen the sensibility of the system, opiates will often happily succeed, when every other remedy fails.

Heart-burn and *diarrhœa*,—common symptoms of breeding, or of pregnancy, must be treated pretty much as at other times. Both complaints chiefly depend on the state of the stomach.

Tumefaction, *tension*, and *pains* in the *mammæ*.—If tight lacing here be only avoided, and the breasts have room to enlarge and swell, no inconvenience ever follows: These effects arise from a natural cause, and seldom require medical treatment. If very troublesome and uneasy, bathing with oil, or anointing with pomatum, and covering with soft flannel or fur, will in most cases prove the cure.

The *menstrual evacuation*—is in some women regular for the first, second, or third period after conception. This seldom happens but in women of sanguinary plethoric habits, such as have been accustomed to large copious evacuations at other times, when the discharge is to be considered as beneficial.

Deliquia, *nervous*, or *hysteric fits*—When these are occasioned by falls, frights, and passions of the mind, they frequently end in the loss of the child: But when they happen about the term of quickening, they seem to arise from the escape of the uterus from its confinement within the capacity of the pelvis; in which case they are commonly slight, of short duration, and never threaten any dangerous consequence.

II. The second class of complaints, viz. those that are incident to the advanced stages of utero-gestation, and that depend on the change of situation of the gravid uterus, its enlargement and pressure on the neighbouring parts are more painful in their symptoms, and more dangerous in their consequences, than those enumerated in the preceding class. The premature exclusion of the fœtus is generally the worst inconvenience resulting from the *one*; the death of the mother, along with the loss of the child, is too frequently an attendant of the *other*.

Difficulty or *suppression* of *urine*—is sometimes occasioned by the pressure of the uterus on the neck of the bladder, before the fundus uteri escapes from its confinement within the brim of the pelvis. This complaint, if early attended to, will seldom prove troublesome or hazardous; but cannot be entirely removed till the uterus rises above the brim of the pelvis, and by its enlargement becomes supported by resting on the expanded bones of the ossa ilia. But if neglected in the beginning,

A retroversion of the uterus—is generally the consequence; a case that demands particular attention.—Here the fundus uteri, instead of being loose, falls back in a reclined state within the hollow of the os sacrum: thus a tumor is formed in the vulva, whereof the os tincæ makes the superior part; the body of the uterus, by this means, becomes strongly wedged between the rectum and bladder; and, from the enlargement of the uterus itself, and accumulating load of fæces and urine, the reduction will prove in many instances utterly impracticable. A total suppression of urine, or a rupture of the coats of the bladder, fever, inflammation, or gangrene of the uterus, often ensue; and these are succeeded by delirium, convulsions, death.

The indications of cure, in this dangerous disease, are sufficiently obvious: For, in the first place, every obstacle that prevents the reduction should be removed: thus the contents of the rectum and bladder must, if possible, be evacuated; emollient fomentations and cataplasms must be applied, if indicated by inflammation or tumefaction of the parts. Secondly, The reduction of the prolapsed uterus must be attempted, by placing the patient upon her knees, with her head low and properly supported. While this is attempted within the vagina, a finger or two should also be passed within the rectum, by which the operation in some cases may be facilitated: but, at other times, no power whatever will be sufficient for this purpose. Lastly, If the reduction be accomplished, the fever, inflammatory symptoms, and other consequences of the disease, must be subdued; and a recurrence prevented by an open belly, rest, and recumbent posture, and promoting a free discharge of urine: means that ought to be persisted in till the uterus rises within the abdomen, when the patient will be secured from future danger.

Difeafes of Pregnancy.

Coftivenefs in pregnancy—is inconvenient. It may proceed from the fame caufe with the preceding complaint; it may depend on the ftomach; the febrile heat, that in many women prevails, will alfo prove an occafional caufe. It may be obviated or prevented by a proper regulation of the regimen, and by fuch gentle laxative medicines as are beft fuited to the ftate of the woman; the chief of which are ripe fruit, magnefia, lenitive electuary, cream of tartar, fulphureous and aloetic medicines, oleum ricini, emollient glyfters.

The piles—frequently arife in confequence of coftivenefs, or from preffure of the gravid uterus on the hæmorrhoidal veins. Thefe are alfo to be removed or palliated by the fame means employed on other occafions; regard being had to this diftinction, which may be applied univerfally to the gravid ftate, that all violent remedies are to be avoided: a light diet fhould be enjoined; the belly fhould be kept moderately open; and topical liniments or cataplafms fhould be applied, fuch as Balf. fulphur. Balf. traumaticum, Liniment. ex ol. palmæ, Ung. fambucin. cum laud. liquid. Poultices of bread and milk with opium, &c. according to the various circumftances of the cafe.

Oedematous fwellings of the legs and *labia*,—are occafioned by the languid ftate of the circulation, by the interruption of the refluent blood from the preffure of the diftended uterus on the vena cava, &c. Thefe, though very troublefome and inconvenient, are feldom however of dangerous confequence, except where the habit is otherwife difeafed; and feldom require puncture, as the fwelling generally fubfides very quickly after delivery. They can only, therefore, at this time, admit of palliation; for which purpofe, along with a proper diet and moderate exercife, a frequent recumbent pofture, open belly, and dry frictions applied to the legs evening and morning, will prove the moft effectual means.

Varicous fwellings in the legs and thighs—from the interruption of the venal blood in thefe parts, occafioned by the preffure of the gravid uterus, are to be treated in the fame manner with the preceding complaint

Pains in the back, loins, cholic-pains, cramp,—occafioned by the ftretching of the uterus and appendages, and from the preffure of the uterus on the neighbouring parts, fymptoms that are moft troublefome in a firft pregnancy, are to be palliated by venefection, an open belly, and light fpare diet. If the patient be of a full habit, and pre-difpofed to inflammatory complaints, where the preffure is very great in the advanced months, or in twins, &c. if proper remedies are neglected, inflammation of the uterus and adjacent vifcera, or dreadful epileptic fits, may quickly enfue; the event whereof is generally fatal. Crampifh fpafms in the belly and legs require the fame palliative treatment; to which may be added friction, and the application of æther, ol. volatil. balf. anodyn. or the like, to the parts affected.

Cough, dyfpnœa, vomitings, difficulty or incontinency of urine, occafioned by the preffure of the bulky uterus on the ftomach, liver, diaphragm, &c.—Complaints that can only be alleviated by frequent fmall bleedings, a light fpare diet, and open belly. The patient fhould be placed in an eafy pofture, fomething between fitting and lying; and when the uterus rifes high, a moderate degree of preffure from the fuperior part downwards, may in fome cafes prove ufeful. But this muft be ufed with great caution: for dreadful are the effects of violent preffure, or tight lacing, during pregnancy. It frequently kills both mother and child, and ought to be guarded from the earlieft months.

Difeafes of Pregnancy.

Epileptic fits,—are a very dreadful and alarming appearance. They generally depend on the fame caufe with the above complaints: they may alfo arife from irritation, excited by the motion and ftirring of the fœtus; and from various other caufes. Such as have had convulfions when young, are moft liable to have them during pregnancy: they happen moft frequently in firft pregnancies, or where the fœtus is very large, or in twins, triplets, &c. In fuch cafes, the diftention of the uterine fibres is fo great, that actual laceration is fometimes the confequence.

At whatever period of pregnancy they feize, the utmoft danger may be dreaded. This, however, will be in proportion to the feverity, duration, and recurrence of the paroxyfm, to the term of gravidation, to the conftitution of the patient, and her condition during the remiffion. The danger is greater towards the latter end of pregnancy than in the earlier months or in time of labour.

Such as arife from inanition, from exceffive and profufe hemorrhagies, from violent blows, falls, &c. or from a ruptured uterus, are for the moft part fatal.

Hyfteric or nervous fpafms muft be carefully diftinguifhed from true epileptic fits. The former are milder than the latter; they are not attended with foamings; they do not affect the pofture; the pulfe is fmaller, feebler, and more frequent; the woman is pretty hearty after they are over; they are followed with no bad confequences, and yield to the common treatment. Women of ftrong, robuft, vigorous conftitutions, are more generally the fubjects of the *one*; the delicate, the nervous, and the irritable, of the *other*.

Epileptic fits generally come on very rapidly; if any previous fymptoms occur, the fit is commonly announced by an intenfe pain in the ferobiculum cordis, or violent head-ach.

In the pregnant ftate, thefe fits are for the moft part fymptomatic, and will therefore only admit of a palliative cure. They may be diftinguifhed into three claffes; thofe of the early months, thofe of the latter, and thofe that come on with labour-pains.

With regard to the cure, the term of pregnancy, as well as the conftitution of the patient, and particular caufe of the difeafe, muft carefully be confidered.

1. Convulfions at an early period of pregnancy chiefly happen to young women of a plethoric fanguine habit; and can therefore only be removed or palliated by a free and bold ufe of the lancet, by an open belly, cool regimen, and fpare diet. After plentiful evacuations, if the ftomach be loaded with acrid faburra or putrid bile, a gentle puke may be of ufe: but fuch remedies, on thofe occafions, muft be employed with great caution. Inftead of a plethoric, if the patient is of a nervous habit, a very neceffary and important diftinction, the intentions of cure will effentially vary. For here opiates in lage dofes and frequently repeated, emollient glyfters, ftupes applied to the legs, the femicupium, and every other means to foothe the nerves and remove fpafmodic ftricture, will prove the moft effectual remedies. If infenfible

Difeafes. or comatous, opium, mufk, and other antifpafmodics, fhould be exhibited by way of glyfter, and the patient ought to be roufed by epifpaftic and ftimulating cataplafms applied to the legs and hams. Convulfions fucceeding profufe evacuations are generally mortal. The vis vitæ, in fuch circumftances, muft be fupported, by replenifhing the veffels with the utmoft fpeed: this is to be done by pouring in nourifhing fluids as faft as poffible by the mouth and by glyfter; warm applications fhould alfo be made to the ftomach and feet, and nervous cordials given internally along with opium.

The treatment of epileptic fits, depending on other caufes than thofe now mentioned, muft be regulated by a proper attention to the particular fymptoms with which they are attended.

2. In the advanced months, fuch complaints are more to be dreaded than in early geftation, as they generally proceed from the irritation occafioned by the diftention of the uterine fibres, or by the preffure of the uterus on the contiguous vifcera: hence the natural functions of thefe parts will be interrupted, the circulation of their fluids will be impeded, and the blood, being thus prevented from defcending to the inferior parts, will be derived in greater proportion to the brain, and overcharge that organ.

The cure muft, in this cafe, chiefly reft on copious and repeated bleedings, an open belly, and fpare diet.

3. Laftly, when fits come on with labour-pains, a fpeedy delivery, if it can be done with fafety, either by turning the child, or by extracting with the forceps when the head is within reach, will prove the moft effectual cure.

When the bladder is diftended, the contents muft be evacuated: if a ftone fticks in the urethra, it muft be pufhed back or extracted. If the fits are the effects of a ruptured uterus, immediate death is generally the confequence.

With regard to the treatment of fuch complaints, no other change is generally requifite, than what arifes from the fymptoms peculiar to this fituation. In general, till after delivery, they will only admit of palliation.

Chap. VIII. *Floodings.*

These, though confined to no particular term, may happen at every period of gravidation. The one is a frequent confequence of the other; the event of both is often hazardous, as the earlier mifcarriages are generally preceded by an effufion of blood from the uterus, which, in the advanced ftages of pregnancy, befides the lofs of the child, always endangers the life of the mother.

The *menorrhagia gravidarum*—may be defined, an effufion of blood from the uterus, confined to no regular or ftated periods, in quantity and duration various, and liable to recur on the flighteft occafions.

The immediate caufe is, a feparation of fome portion of the placenta or chorion from the internal furface of the uterus. Whatever occafions this feparation may be confidered as the remote caufe, which, though various, may be reduced to

I. Thofe that affect the general fyftem: as, Abortion.

1. External accidents changing the ftate of the circulation.
2. Changes in the circulation from internal caufes.
3. Debility.
4. Plethora.

II. Thofe that affect the uterus and placenta: as,

1. Direct affections.
2. Stimuli communicated from an affection of other parts.

With regard to the cure.—Though a flooding in fome conftitutions may happen, even in early geftation, and may remit and recur from time to time, and the woman go on to the end of her reckoning; and tho' it feldom or never happens that this complaint proves mortal to the mother in the firft five weeks of pregnancy; yet every appearance of this kind, even the flighteft, is to be dreaded; as in the early months it will often throw off the fœtus, and, in the latter, always threatens the utmoft danger both to mother and child. Floodings of gravid women we cannot propofe radically to cure; they will only admit of palliation. With this view, the indications are,

I. To leffen the force and velocity of the blood in general.

II. To promote the conftriction of the patulous mouths of the bleeding veffels, or the formation of congula in their orifices.

1. To anfwer the firft indication, reft and a recumbent pofture, cool air, tranquillity of mind, a light diet, venefection, and opiates, are the chief means.

2. To reftrain the violence of the hemorrhagy, internal aftringent medicines are recommended; but this is to be accomplifhed chiefly by means of cold ftyptic applications to the parts and their neighbourhood. But as thefe floodings often arife from fo various and oppofite caufes, it is difficult to lay down particular indications, or to point out a method of cure fuited to every cafe that may occur. The intention of cure can only be regulated by a careful and judicious confideration of the caufe, and of thofe particular circumftances with which the cafe may be attended. In early pregnancy, it may be reftrained by keeping the patient quiet and cool, by giving internally cooling things and opiates; but, in the advanced ftages, the deluge is fometimes fo profufe as to kill very fuddenly. Under fuch circumftances, when the woman is near her time, emptying the uterus by delivery, if practicable, is the only fafe expedient both for preferving the life of the mother and of the child.

If the hemorrhagy can be reftrained, a recurrence muft be guarded againft, by avoiding or counteracting the occafional or remote caufes.

Chap. IX. *Abortion, or Mifcarriage,*

May be defined, the premature expulfion of the embryo or fœtus. Some, however, make the following diftinction: When a woman mifcarries in early geftation, this they confider as an abortion; but if in the latter months, that they term a *premature birth.* The fymptoms that threaten abortion are:

Flooding.

Pain

Abortion.

Pain in the back and belly.

Bearing down pains with regular intermiffions.

The evacuation of the waters.

The death of the child, which difcovers itfelf by the following fymptoms; though in general thefe are fo doubtful and fallacious, that none of them afford an infallible fign:

1. The fubfiding of the abdominal tumor.
2. Ceffation of motion in the fœtus.
3. The fenfation of a heavy weight falling from fide to fide, as the woman turns herfelf in bed.
4. Sicknefs, faintings, rigors, cold fweats.
5. The breafts turning flaccid.
6. Coldnefs of the abdomen, and putrid difcharge from the vagina.

Abortions are feldom dangerous in the firft five months; but a frequent habit of mifcarriage debilitates the fyftem, fhatters the conftitution, and lays the foundation of chronic difeafes of the moft obftinate and dangerous nature.

In the advanced months, the prognofis will be more or lefs favourable according to the patient's former ftate of health, the occafional caufe, and fymptoms with which it is attended. The proximate caufe of abortion is the fame with that of true labour, viz. a contracting effort of the uterus and abdominal mufcles, affifted by the other expulfive powers. The remote caufes cannot be explained with precifion; as many circumftances, with regard to the nature of impregnation, and connection of the fœtus with the placenta and uterus, are fubjects ftill involved in darknefs. They may in general, however, be reduced,

I. To whatever interrupts the regular circulation between the uterus and placenta.

II. To every caufe that excites the fpafmodic contraction of the uterus, or other affifting powers.

III. To whatever occafions the extinction of life in the fœtus.

Amongft the firft are:

1. Difeafes of the uterus.
2. Impervioufnefs or fpafmodic conftriction of the extremities of the uterine blood-veffels.
3. Partial or total feparation of the placenta or chorion from the uterus.
4. Determination to other parts.

To the fecond general head belong all caufes that produce a ftrong contraction of the elaftic fibres of the uterus, or of the parts that can prefs upon it, or that occafion a rupture of the membranes: fuch as,

1. Violent agitation of mind or body.
2. A difeafe of the membranes.
3. Too large a quantity of liquor amnii.
4. The crofs pofition of the fœtus.
5. Its motion and kicking.

The laft head includes the numerous caufes of the death of the child, which, befides thofe referred to in the preceding claffes, may be occafioned by,

1. Difeafes peculiar to itfelf.
2. Difeafes communicated by the parents.
3. External accidents happening to the mother: or,
4. Accidents incident to the fœtus in utero.
5. Difeafes of placenta or funis.
6. Knots and circumvolutions of the chord.
7. Too weak an adhefion of placenta or chorion to the uterus: and,
8. Every force that tends to weaken or deftroy this attachment.

With regard to the treament. This muft be varied according to the particular circumftances of the cafe: nor is it poffible to point out particular indications, or propofe any regular plan to be purfued for this purpofe. Abortion is often preceded by no apparent fymptom, till the rupture of the membranes, and evacuation of the waters, announce the approaching expulfion of the fœtus. Either to remove threatening fymptoms, or to prevent mifcarriage when there is reafon to apprehend it, often baffles our utmoft fkill; becaufe it generally happens, that there is a ceffation of growth in the ovum; or, in other words, an extinction of life in the fœtus, fome time previous to any appearance of abortion. For inftance, in early geftation, a woman commonly mifcarries about the 11th or 12th week; but the age of the fœtus at this time is generally no more than eight weeks. At other times, when by accident the fœtus perifhes, perhaps about the fifth or fixth month, it will ftill be retained in utero, and the expulfion will not happen till near the completion of full time.

As women who have once abforbed are fo liable to a recurrence from a like caufe, at the fame particular period, fuch an accident, in future pregnancies, fhould therefore be guarded againft with the utmoft caution. On the firft appearance of threatening fymptoms, the patient fhould be confined to a horizontal pofture; her diet fhould be light and cooling; her mind fhould be kept as tranquil as poffible; a little blood from the arm may be taken occafionally; and opiates adminiftered according to circumftances: but excepting fo far as depends on thefe, and fuch like precautions, for the moft part, in the way of medicine, very little can be done.

Manual affiftance is feldom or never neceffary during the firft five months of pregnancy: the exclufion of fœtus and placenta fhould very generally be trufted to nature.

The medical treatment of abortion muft therefore be confidered with a view only to the prophylacticcure: and this again will chiefly confift in a proper

Regimen.

Chap. X. *Regimen during Pregnancy.*

Women, when pregnant, fhould live a regular temperate life; moderation in eating and drinking fhould now be very carefully obferved, and every thing that has any tendency to difagree with the ftomach fhould be avoided; otherwife the manner of life fhould be much as ufual. If complaints do occur, thefe fhould be treated as at other times; only guarding againft fuch things as, by violent operation, may endanger mifcarriage. If the woman has formerly been fubject to this accident, the caufe fhould be carefully confidered, and fuitable remedies applied; if plethoric, for inftance, fhe fhould be blooded, live fparingly, and kept quiet, till fhe gets beyond the dangerous period. If fhe be weak, delicate, and nervous, bark, light aromatic bitters, mineral waters, and the cold bath (if able to bear it), will prove the beft prophylactic remedies. The cold bath has, in many cafes, cured the moft obftinate fluor albus, and fometimes even fterility itfelf; and, in relaxed habits difpofed to mifcarriage, when every other

means

Regimen. means has failed, the cold bath has done considerable service: the practice may safely be continued for some months after conception, when it has been early begun, or when the patient has been accustomed to it. Such a shock will, however, act very differently on different systems: hence it is an expedient by no means to be indiscriminately used in the pregnant state.

Abortions that happen in early gestation, and that come on suddenly without any presaging sign, if ever they are to be prevented, it can only be done by avoiding all occasional causes, by counteracting morbific dispositions, and by confinement to a horizontal posture, for some time before, and till the critical period be over.

When a venereal taint in the parents is suspected to be the cause either of abortion or the death of the fœtus, the like accident can only be prevented by putting both parties on a mercurial course.

Pregnant women require a free pure air; their amusement should often be varied; their company should be agreeable and cheerful; their exercise should be moderate, and suited to their inclination, constitution, and the season; they should avoid crowds, confinement, travelling over rough roads in a carriage, or being exposed to sea-voyages. Riding a-horseback should also be practised with great caution, that disagreeable objects may be shunned, and shocks of every kind prevented. For this reason, when riding is judged proper, the woman should be a courageous rider; she should never ride without somebody being in company; the horse should be tame and well trained; the road should be smooth as well as private; and the exercise should be gentle and easy, and never carried the length of fatigue. Women should, with the utmost care, guard against confining the breasts or belly; early recourse should be had to jumps, and they should keep themselves as loose and easy as possible through the whole term of utero-gestation. An open belly is necessary and important in the pregnant state; it keeps the stomach in good condition, prevents cholics and other complaints that may terminate in miscarriage. When the abdomen is pendulous towards the latter months, a gentle support by proper bandage will prove useful; and the woman, when fatigued, should occasionally, through the day, indulge in rest on a bed or couch.

PART II. OF LABOURS.

LABOURS are divided into three classes: *natural*, *laborious*, and *preternatural*.

In whatever manner the head of the child presents, where the delivery at full time is performed by nature, the labour is with great propriety called *natural;* when the birth is protracted beyond the usual time, or cannot be accomplished without extraordinary assistance, it is deemed *laborious;* and *preternatural*, when any other part but the head presents.

CHAP I. *Natural Labour.*

BY whatever power the uterus is enlarged, when any further increase is prevented, a stimulus to contraction must ensue; by this means an uneasy sensation is excited, which must, in the woman, produce an effort to procure relief: and thus arise the true labour-pains, which at first are slight and of short duration, a considerable remission intervening: the periods of recurrence soon become more frequent; the pains acquire an increased force, producing more and more change on the os uteri; which, yielding to the impelling cause, gradually opens and expands; till at length it becomes completely dilated, the membranes protruded and ruptured, and the child, by the expulsive force of the uterus, assisted by that of the diaphragm and abdominal muscles, is thus pushed along and delivered.

The symptoms of approaching labour are, The subsiding of the abdominal tumor: hence a discharge of mucus from the vagina, sometimes tinged with blood; incontinency, or suppression of urine; tenesmus; pains of the belly, loins, and about the region of the pubes; restlesness, hot and cold fits, &c.

Spurious pains are to be carefully distinguished from those of genuine labour. The former arise from the stretching of the uterus and its pressure on the neighbouring parts, or from costiveness; and are to be distinguished from the latter by the following symptoms: They are most troublesome towards the evening, increase in the night, and abate through the day; they are more trifling and irregular than true uterine pains; the uterine orifice is not affected; and there is no increased flow of mucus from the parts.

True pains begin about the region of the kidneys, strike forward towards the pubes, and down the thighs: they return at regular periods: there is a copious discharge of mucus from the vagina; the os uteri gradually opens, and can be felt to dilate in time of a pain; while the membraneous bag, in a tense state, forcibly pushes against the finger.

The event of labours is so precarious, that no certain judgment can be formed from almost any symptoms, till the labour itself be considerably advanced. A prognosis in general is chiefly to be formed from the age, state of health, and temperament of the patient; from the force, duration, and recurrence of the pains; and from their effect on the uterine orifice; from the time of the rupture of the membranes; from the general make and form of the woman, but, in particular, of that of the pelvis; from the bulk and position of the child, &c.

With regard to the method of delivery, and position of the woman, this has been different at different ages, and in different countries: the chief thing, however, is to guard against cold and fatigue, observing that the woman be placed in the most favourable posture for supporting the back, for the action of the abdominal muscles, &c. and most convenient for the necessary assistants: till the labour is considerably advanced, she may be indulged in whatever posture is most agreeable; after which the bed or couch is the most proper.

With regard to assistance in natural parturition, the accoucheur

Natural Labour.

accoucheur for the moſt part has little to do, till the membranes are ruptured, and the head in perinæo. In time of labour, the woman ſhould be kept very cool, and every means of being overheated ſhould be avoided. She ſhould be put to bed in proper time, placed on her ſide or back, with her head and ſhoulders a little raiſed, a cloth tied to the bed-poſt, or held by an aſſiſtant, to ſupport her hands in time of pain, and her feet reſting againſt a foot-board; her knees ſhould be drawn up towards the belly, and a folded pillow put between them. All efforts to preſs or ſtrain, except what nature excites, are improper, hurtful, and ſhould be avoided: the membranes, if poſſible, ought not to be ruptured till they almoſt protrude at the os externum; the perinæum muſt be lubricated when formed into a tumor, and carefully ſupported while overſtretched; for this purpoſe, a cloth ſmoothly folded ſhould be applied over the part, to enable the accoucheur to have a firmer hold. This is an important part of his office; and muſt be attended to with the ſtricteſt care. From the time this protruſion begins to form till the head of the child be completely delivered, the perinæum muſt be carefully preſerved by the palm of the hand firmly applied againſt it, which ſhould be carried backwards in a direction towards the anus, and kept ſo during every pain. Thus the miſerable conſequences will be prevented to which the neglect of this preſſure expoſes: for by this ſupport the overſtretching of the perinæum will be greatly leſſened, the parts will dilate gently and gradually, the vertex will eaſily ſlip from under the pubes, and the fore-head will riſe from under the perinæum in a ſafe, ſlow, and gentle manner. The perinæum muſt now be releaſed, by cautiouſly ſliding it over the face and chin of the child; and this ought to be made further ſure of, by paſſing a finger under it round and round. After the head has thus mechanically advanced through the pelvis and vagina, a pain or two muſt be waited for, when in like manner the body will follow; nothing more being neceſſary than to ſupport the child while it is gradually puſhed forwards by the expulſive force of the natural pains.

When the child has cried, and the change in the circulation freely taken place, the funis umbilicalis muſt be tied and divided, the infant muſt be wrapped in a warm receiver, and given to the nurſe to be waſhed and dreſſed.

The parts of the woman muſt now be gently wiped, a warm ſoft cloth muſt be applied, and a proper time waited for the ſeparation of the placenta.

This is alſo the work of nature, and ſeldom requires more force to bring it along than if it lay entirely looſe within the cavity of the uterus. Thus, in pulling, no greater force ſhould be employed than is juſt ſufficient to put the funis on the ſtretch: for if it is already ſeparated, no violence is neceſſary to extract it; and if the adheſion is very firm, all violent efforts are improper, and often followed with moſt dangerous conſequences. Its advancing is known by the contraction of the uterus, and ſhifting of the abdominal tumor, and by the lengthening of the cord By the ſpontaneous contraction of the uterus, this ſeparation is effected; the expulſion will be ſlower or more expeditious, according to the ſtate and condition of the woman, according to the number of children ſhe has born, and according to the duration or violence of the labour; it is eaſier and ſooner ſeparated in a firſt birth, when the woman is in good health, and when the labour has been properly managed. In moſt caſes, this ſeparation is accompliſhed within half an hour after the delivery of the child. It adheres moſt firmly after premature births, when the woman has been ſickly during pregnancy, where the labour has been tedious and difficult, or when haſty attempts have been made to extract it. A finger, or finger and thumb, guided by the funis, and introduced within the vagina, to bring down the edge, will remove any difficulty occaſioned by the centre or bulky part paſſing the uterine or vaginal orifice.

When it becomes neceſſary to employ force in extracting the placenta, which is never requiſite but in caſes of flooding, when the woman has been in bad health during pregnancy, when ſhe has ſuffered much in time of labour, or when the ſtring has been torn from it (though the firſt of theſe caſes is perhaps the only one wherein the practice is abſolutely proper), the method of doing it is as follows: In ordinary caſes, the woman ſhould be laid on her back or ſide; but when the belly is pendulous, or when the placenta is attached to the fundus uteri, ſhe muſt be placed on her knees, which is the moſt convenient poſture.

The accoucheur, though with a certain degree of courage, yet with the utmoſt poſſible tenderneſs, muſt then paſs his hand well lubricated through the vagina into the uterus, and feel for the convex body of the after-birth; if the chord be entire, this will direct him; if not, he muſt feel for the looſe membranes at the edge of the cake, and muſt not be deceived by coagula of blood that lie in the way; if the uterus be conſtricted in the middle like a ſand-glaſs, a circumſtance that ſometimes, though rarely, occurs, this muſt be overcome by a gradual dilatation with one finger after another, till the whole hand in a conical manner can ſafely be paſſed. He muſt not content himſelf with feeling a part; he ſhould be able to move his fingers round the whole body of the cake; the adheſion muſt be ſeparated very gradually, in a direction from the ſides round and round. The placenta is diſtinguiſhed from the uterus, as well by its ſoftneſs as by its convex puckered feel. This convexity increaſes in the ſame proportion as the uterus contracts: hence the middle part or centre of the placenta is firſt detached; and if the edges are carefully ſeparated, by gently paſſing the fingers behind, the whole body becomes looſe and diſengaged, which muſt now be brought along with great caution, that no part be left behind, and that no injury be done to the woman in making the extraction.

Though bad conſequences ſometimes follow from the retention of the placenta, yet it is much to be queſtioned, if theſe are not leſs to be dreaded than the dangerous floodings, convulſions, deliquia, inflammation of the uterus, fever, &c. that may be induced from the prepoſterous practice of paſſing the hand to make the extraction: and would it not in general be better to confine the practice of introducing the hand, to caſes of uterine hemorrhagies only? Where the adheſion is ſo firm as to require force, or where its place of attachment is out of the reach of the finger, by which, for the moſt part, the edge may be brought

Difficult Labour.

down, is it not by far the safest and the most rational practice universally to trust to nature? Should the mouth or body of the uterus become constricted before the separation is effected, no matter; little is to be dreaded: it will afterwards kindly dilate; and the separation and expulsion will spontaneously be accomplished with as much safety as in other animals, where no force is ever used. Let every candid practitioner acknowledge, that for one instance where the retention of the placenta has been attended with dangerous consequences, a precipitate or forcible extraction has proved fatal to hundreds.

After the delivery of child and placenta, the woman must rest a few minutes; her strength and spirits may be recruited by some light nourishing cordial: the wet cloths, &c. must then be removed; the bed must be properly shifted and adjusted; and a gentle compression must be made on the abdomen.

During lying-in, the woman should avoid company and noise; her dress and bed-linens should be often changed; she should avoid every means of being overheated; and with regard to her diet, it should, for the first week at least, be very light and of easy digestion.

CHAP. II. *Laborious or difficult Labour.*

Hamilton's Outlines.

WHEN the birth is protracted beyond the ordinary time, or when the child's head, though naturally presenting, cannot be brought forwards without assistance, the labour is accounted difficult or laborious.

Though the causes of laborious births are various and complicated, they may in general be considered as depending,

I. On the mother.
II. On the child.
III. On the secundines.

I. The birth may be protracted, or the labour-pains interrupted, by,
  (1.) Debility in the mother, arising,
    a From disease, *viz.*
      1. Flooding.
      2. Epileptic fits.
      3. Crampish spasms.
      4. Lowness and faintishness.
      5. Inflammatory diathesis.
      6. Colic.
      7. Nauseating sickness and vomiting.
      8. Hectic or consumptive habit.
    b From passions of the mind.
    c From mismanagement in time of labour.
  (2.) Local complaints in the parts, or their neighbourhood, *viz.*
    a In the bones, occasioning narrowness and distortion.
    b In the soft parts, *viz.*
      1. Dryness and constriction of the vagina.
      2. Thickness and rigidity of the os tincæ.
      3. Scirrhous or polypous tumors about these parts
      4. Accumulated fæces in the intestines.
      5. Stone in the urethra.
      6. Prolapsus of the uterus, vagina, and rectum.
      7. Obliquity of the uterus.

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II. Difficulties also arise on the part of the child, *viz.*
  1. From the bulk and ossification of the head.
  2. The situation in which the head presents.
  3. Large broad shoulders, or their transverse descent through the pelvis.
III. The secundines, *viz.*
  1. The rigidity of the membranes, and the contrary.
  2. Too great a quantity of water.
  3. The funis umbilicalis too long or too short.
  4. The prolapsus of the funis before the child's head: and,
  5. The attachment of the placenta towards the cervix or os uteri.

The treatment of laborious births requires a very nice and careful attention to the condition of the patient and other circumstances, from whence only we can judge when assistance becomes requisite, and how it may be applied to the best advantage. That pain and misery is the unavoidable and inseparable attendant of child bearing, though dealt out in different proportions to different subjects, the testimony of all nations, and all ages, as well as daily experience, bear witness: nor is the easiest labour altogether exempted from pain, even under the most favourable circumstances. The delivery, however, promises to be safe and easy, when the woman is of proper age, in good health, the child presenting right, and the pelvis well proportioned; but the force of the natural pains may be interrupted, and of consequence labour be retarded, from,

I. Debility in the mother, arising from
  a Disease. This may appear under various forms; as,

1st, A flooding. Which is very alarming, even along with labour-pains: though less so in this case than when at a distance from full time; because as the labour-pains increase, the hemorrhagy very generally abates: or if not, breaking the membranes when the aperture of the os uteri is sufficient to admit the hand, seldom fails to produce that effect. The woman in this case must be kept cool. Opiates must be administered; she must be comforted with the best assurances of a happy delivery; and the natural pains must be waited for.

But if the hemorrhagy proceeds from a separation of the placenta, attached towards the cervix or orificium uteri; in this unhappy case, the whole body of the cake may be completely separated before the aperture of the uterus be sufficient for allowing the head to pass; and the deluge may be so sudden and impetuous, that the woman will sink immediately under it. Breaking the membranes, and making the delivery, either by turning the child, or extracting with the forceps or crotchet, according to circumstances, with as much expedition as is consistent with the mother's safety, is the only expedient by which the threatening catastrophe may be prevented.

2dly, Epileptic fits may in like manner retard labour, and endanger the life of the mother. If the child is not thrown off by a few fits, which is often the case, the delivery should be effected as soon as possible.

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3dly, Crampifh fpafms in the thighs, legs, rarely in the belly, are very troublefome. They depend on the preffure of the head on the nerves as it paffes through the pelvis, and can only be removed by delivery; which, as thefe pains are feldom if ever attended with danger, is not to be forced on this account. Breaking the membranes will fometimes remove them.

4thly, Lownefs and faintifhnefs often occur, and frequently prove the caufe of protracted labour.

No general rules with regard to the management of flow labour can be recommended. The mode of treatment, where fo many circumftances may occur, muft be fuited to the condition of the patient, as every particular cafe will in fome meafure require a different management. Much depends on the prudence and judgment of the attentive practitioner. For inftance, when the woman is nervous, low-fpirited, or weakly, from whatever caufe, in general her ftrength muft be fupported: fhe muft not be put on labour too early; fhe muft avoid heat, fatigue, and every means of exhaufting her ftrength or fpirits. When fhe is reftlefs, or the pains trifling and unprofitable, opiates are particularly indicated; they remove fpurious or grinding pains, recruit the fpirits, procure reft, and amufe time. Little elfe for the moft part is to be done. If the uterus once begins to dilate, though the dilatation goes on flowly, it is by much the beft and fafeft practice to do nothing but regulate the management as above. The pains at laft will become ftrong and forcing; and the delivery, even where the patient has been very weakly, will often have a fafe and happy termination. In thefe tedious labours, if the ftrength of the woman be properly fupported, every thing almoft is to be expected from nature. Forcible means fhould be the laft refource.

5thly, Inflammatory diathefis, in young fubjects of ftrong rigid fibres and plethoric habits, muft be obviated by venfection, an open belly, and cooling regimen.

6thly, Colic.—Many women have fevere attacks of this difeafe immediately before the labour-pains come on; the reafon of which is fufficiently obvious: the belly, which formerly rofe fo high that the fundus of the womb preffed againft the pit of the ftomach, afterwards fubfiding, by the child's finking to the lower part of the womb, and the oval of the head being applied to the oval of the bafin, the contents of the inteftines will be forced lower and lower, and the ftrait gut will be diftended. Hence colic-pains, irritation, and uneafinefs, a frequent defire to go to ftool, or frequent loofe ftools, generally enfue. The beft palliative remedy is to inject emollient glyfters repeatedly till the bowels be entirely emptied. Although fome degree of purging fhould attend the tenefmus, it will be neceffary to wafh the ftrait gut, by the ufe of one or more glyfters. The irritating caufe being in this way removed, an opiate, if no inflammatory heat or fever prevents, may be afterwards given with advantage.

7thly, Naufeating ficknefs, with vomiting.—When thefe fymptoms occur, warm water or chamomile-tea muft be drunk freely. Sicknefs and vomiting happen in fome degree in the eafieft labours. Sometimes they proceed from a difordered ftate of the ftomach; but in general are to be accounted for from the well-known fympathy of the womb with the ftomach; and accompany the ftretching of the os uteri only.

8thly, Hectic or confumptive habit.—It is a melancholy thing to attend a labouring woman in this ftate. The pains are weak and trifling; fhe cannot force much down; and fhe is feeble, and liable to faint when the pain goes off. But however apparently exhaufted, the progrefs of labour goes on, in moft cafes, much better than could be well expected. The orifice of the womb gives little refiftance to the force of the pains, weak and trifling as they are; the parts are foft and lax, and foon ftretch in fuch a manner, that, if there be no fault in the pelvis, the child readily obtains a paffage.

Here little is to be done but fupplying the patient from time to time with light nourifhment; with cordials that do not heat: and keeping up a free circulation of cool air all around her: for this purpofe the curtains fhould be quite drawn afide, doors and windows widely opened; and fhe fhould be placed in a pofition with her head and breaft well raifed, that an eafy refpiration may be promoted. Hectic women under proper management rarely fink immediately after delivery; they generally furvive a week or longer, tho' they feldom outlive the month.

b. Paffions of the mind. Any piece of news in which the patient, her family, or relations, are interefted, fhould be carefully concealed, as well as every thing that tends in general to affect the paffions; as labour may not only be interrupted from this caufe, but the moft dangerous fymptoms, as floodings, convulfions, deliquia, and fatal fyncope, may be induced.

c. From mifmanagement in time of labour often arifes debility; fo that the patient's ftrength is exhaufted, the pains at length entirely ceafe, and the head of the child remains locked in the pelvis, merely from want of force or pain to pufh it forwards. In all cafes where the labour has the appearance of being tedious, the woman's patience muft, as much as poffible, be fupported. During the grinding pains, fhe muft be kept cool and quiet: opiates may be exhibited to pafs the time, till the forcing throes enfue, when fhe will acquire refolution, the parts will dilate kindly, and the labour end happily; whereas, if fhe confiders herfelf in labour from the earlieft appearance of grinding pains, fhe is frightened at the length of time, and her patience runs out. Slow lingering labours happen chiefly to elderly women having a rigidity in the parts, to nervous fubjects, and to fuch as have been weakly during pregnancy. It is of great confequence, and the advice cannot be too much inculcated, to avoid exhaufting the woman's ftrength too much at firft.

2. *Local complaints in the parts, or their neighbourhood.*

a. Narrownefs or diftortion of the bones of the pelvis. Where there is any material defect in this cavity, a fuperficial knowledge of the form and ftructure of the parts will enable us to judge. If, from the figure of the woman's body, there is reafon to fufpect a faulty pelvis; if the fpine is twifted, the legs crooked, the breaft-bone raifed, or the cheft narrow; whether the pelvis be affected or not, fhe will require a particular management; for the conftitution of fuch women is weak

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weak and feeble, and they cannot be much confined to bed on account of their breathing. We can never be abfolutely certain of a diftortion of the pelvis (except when the diftortion is confined to the inferior aperture) till the uterine orifice is confiderably dilated. After this time, if the pains are ftrong and forcible, and the head of the child makes no advance, a narrow pelvis or large head is to be fufpected. The pelvis may be faulty at the brim, bottom, or in the cavity or capacity. The firft of thefe, which moft frequently occurs, is the moft difficult to be difcovered. The fecond can be readily perceived by the touch: for we can feel the defects in the fhape of the os facrum and coccyx, in the pofition of the ifchia, and in the bending of the pubes; and where the diftortion is fo general, that the whole cavity of the pelvis is affected, the fhape of the woman's body, the flow progrefs of the labour, and the ftate of the parts to the touch, will afford fufficient information.

In the firft cafe, we can only know the diftortion by the fymptoms; for we fhould not attempt to introduce the hand till the mouth of the womb be dilated: it is afterwards unneceffary; for we know that the pelvis is too fmall, or the head too large, by its not advancing in proportion to the pains, and by feeling a fharp ridge like a fow's back on the top of the child's head, which is occafioned by the bones rifing over each other in confequence of the preffure.

How long nature, in fuch circumftances, can fupport the conflict, it is difficult to fay. It is fufficient to obferve, that when things are properly prepared for the advance of the child, when the firft ftage of the labour is accomplifhed, but its progrefs is then fufpended, it is of little confequence to the midwife whether the obftacle is to be referred to the child or to the mother; and a man-midwife ought to be immediately called in.

If the patient's ftrength declines; if the head, from being locked in the bones of the pelvis, begins to fwell, and the parts of the woman to be affected with tumefaction and inflammation; nature, in this cafe, feems infufficient, and it will be dangerous longer to delay the proper means of making the delivery; as mother, or child, or both, may fall a victim to our neglect. We muft not, however, allow ourfelves to be impofed on, either by the impatience of the diftreffed mother, or by the clamours of the officious impertinents about her. In affording that affiftance we are able to give, we are only to be directed by the fymptoms of the cafe: we muft remember, that the gentleft affiftance our hands or inftruments in laborious births can afford, is always attended with hazard and rifk; that if inftruments be applied too early, nature will be thus interrupted in her work, and the moft fatal confequences may enfue; and that if affiftance be delayed too long, the mother may die undelivered: we ought, however, to be informed, that the former practice of having too early recourfe to forcible means, where, in time, nature unaffifted might do her bufinefs, has proved by far more fatal than the latter. We ought therefore carefully to confider the general hiftory of the patient, and particular circumftances of the cafe, that we may hit the proper time of making the delivery; which, in thefe laborious labours, is exceedingly difficult to determine; yet is a matter of the utmoft importance, as there is always one, often two or more lives at ftake, and the accoucheur is accountable for the confequences of his mifconduct or neglect.

b. The fault may be in the foft parts: as,

1. Drynefs and conftriction of the vagina. Here all ftretching and fcooping is to be avoided. The natural moifture is to be fupplied by lubricating with pomatum or butter, or by throwing up injections of warm oil; the parts are likewife to be relaxed by the application of warm ftupes, or by warm fteams directed to them.

2. Thicknefs and rigidity of the os tincæ. This happens chiefly in women well advanced in life, where the parts open more flowly, and the labour generally proves more tedious. Here alfo little is to be done but waiting on with patience, comforting the woman as well as poffible, and giving an opiate from time to time. The parts may be relaxed with butter or pomatum, by throwing into the vagina injections of warm oil, or by the application of warm ftupes to the os externum. Every forcible attempt to open or ftretch the uterus, as fome authors prefume to advife, is apt to induce inflammation and its confequences, and to interrupt the natural pains: it is therefore univerfally the fafeft practice to truft in every cafe to thefe; though tedious, or even violent, the labour for the moft part will end more happily, and the woman recover better, than if force had been employed.

3. Polypous tumors, &c.—There is feldom occafion, in cafe of cicatrices in the vagina, to dilate with the fcalpel, to remove polypous tumors by excifion, or to cut upon and extract a ftone from the urethra in time of labour. But if circumftances are urgent, fuch expedients are fafe and practicable, and warranted by many precedents.

4. Accumulated fæces in the inteftines ought always to be removed by repeated emollient glyfters on the firft appearance of approaching labour.

5. A ftone in the urethra, if it cannot be pufhed back, muft be cut upon and extracted, as already advifed.

6. Prolapfus of the uterus may happen even at full time, in a pelvis too wide in all its dimenfions; for which, however, nothing can be done but to fupport the uterus in time of a pain, that the ftretching of the parts may be gradual. Prolapfi of the vagina and rectum muft be reduced at the remiffion of the pain, and a return by gentle preffure muft be prevented.

7. Obliquity of the uterus, though a favourite theory of fome authors, never happens in fuch a dergee as to influence delivery, except in the cafe of a pendulous abdomen, or where it depends on the make or diftortion of the pelvis. The firft of thefe, though it may, by throwing the child's head over the pubes, occafion perhaps fome little delay, will feldom prove any material obftacle to the progrefs of the labour.

II. The protraction of labour may depend on the child, and may arife from,

1ft, the bulk or offification of the head.

There may be either a natural difproportion between the head and body, or the fwelling may be occafioned by a putrid emphyfema in confequence of the child's death, or the enlargement may proceed from a hydrocephalus.

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cephalus. The firſt of theſe caſes can only be diſcovered by the ſlow progreſs of the labour, when the pains are ſtrong and frequent, the ſoft parts ſufficiently dilated, the woman in good health, and no other apparent cauſe to account for the remora. The ſecond is diſcovered from the hiſtory of the caſe, from the common ſymptoms of a dead child, *viz.* the puffy emphyſematous feel of the preſenting part of the head, and from the ſeparation of the cuticle when touched. Laſtly, the hydrocephalus is diſcovered by the head falling down in the pelvis in a large bulky form, by the bones of the head being ſeparated at conſiderable diſtances, and by a fluctuation evident to the touch. On the whole, however, it may here be obſerved, that the moſt probable or ſuſpicious ſymptoms of the child's death are often deceitful.

From whatever cauſe the head is enlarged, if the difficulty ariſes from this cauſe, and the force of the pains prove inſufficient to puſh the head forwards, recourſe muſt be had to inſtruments; and if the bulk of the head is too large to paſs the diameter of the pelvis, the cranium muſt be opened to diminiſh its ſize, and the brain evacuated previous to the extraction.

2dly, The poſition of the head, which may be ſqueezed into the pelvis in ſuch a manner as not to admit of that compreſſion neceſſary for its paſſing. Such a cauſe of difficulty, however, more ſeldom occurs than many authors have imagined. The raſh and prepoſterous application of inſtruments has, in ſuch caſes, proved the bane of thouſands. Here though the labour will prove more painful and more tedious, yet nature in general, unaſſiſted, will accompliſh her own work with more ſafety to mother and child, than by the intruſion of officious hands. Turning here is always difficult, often dangerous. The ſame obſervation will hold of inſtruments, which ſhould never be employed but when alarming ſymptoms occur: the aſſertion perhaps is not more bold than true, that, in general, the moſt diſadvantageous poſition in which the head can offer is not ſufficient, without ſome other cauſe concurring, either to prevent delivery, or to endanger the life of mother or child ſo much as would be done by the movement of the gentleſt hands. Yet, in ſome caſes, where the woman is weak and exhauſted, and the pains trifling; if the head of the child be large, the bones firm, and the ſutures cloſely connected; or if there be any degree of narrowneſs in the pelvis, a difficult labour is to be expected; and the life of both mother and child will depend on a well-timed and ſkilful application of the ſurgeon's hands.

The unfavourable poſition of the head may be referred to two kinds, which include a conſiderable variety. 1. When the fontanella, or open of the head, preſents inſtead of the vertex. 2. Face caſes.

If no other obſtacle appears but the preſenting of the fontanella, the labour will by proper management generally end well; and much injury may be done by the intruſion of officious hands.

Face-caſes are the moſt difficult and laborious of all kinds of births; and our ſucceſs in theſe will chiefly depend upon a prudent management, by carefully ſupporting the ſtrength of the woman. The varieties of face-caſes are known by the direction of the chin; for the face may preſent, 1. With the chin to the pubes; 2. To the ſacrum; 3. To either ſide. The rule in all theſe caſes is to allow the labour to go on till the face be protruded as far down as poſſible. It is often as difficult and hazardous to puſh back the child, and to bring down the crown or vertex, as to turn the child and deliver it by the feet. Sometimes a ſkilful artiſt may ſucceed in his attempt to alter the poſition, when he has the management of the delivery from the beginning; or, in thoſe caſes where the face is conſiderably advanced in the pelvis, may be able to give aſſiſtance by paſſing a finger or two in the child's mouth, and pulling down the jaw; which leſſens the bulk of the head; or, by preſſing on the chin, to bring it under the arch of the pubes; when the crown getting into the hollow of the os ſacrum, the head will afterwards paſs eaſily.

3dly, The breadth of the ſhoulders, or their tranſverſe deſcent through the pelvis, rarely proves the cauſe of protracted labour. The head is always pretty far advanced before any obſtruction can ariſe from this cauſe; and if the head has already paſſed, in a pain or two the ſhoulders will follow. The ſame reaſoning will alſo apply with regard to the aperture of the uterus itſelf, if the head paſſes freely, in like manner will the ſhoulders; the os uteri rarely, if ever, is capable of contracting upon the neck of the child, and thus preventing the advance of the ſhoulders; and ſhould this prove the caſe, what can we do but wait with patience? After the delivery of the head, if the woman falls into deliquia, or if, after ſeveral pains, the ſhoulders do not follow, and the child's life be in danger from delay, we ſhould naturally be induced to help it forward in the gentleſt manner we are able, by paſſing a finger on each ſide as far at the axilla, and thus gradually pulling along.

III. Laſtly, From the ſecundines, difficulty and danger ſometimes ariſe.

1ſt, The rigidity of the membranes, and the contrary. From the firſt of theſe cauſes, the birth is ſometimes rendered tedious; but as the ſame effect is much oftener produced by the oppoſite cauſe, and the conſequences of the latter are more troubleſome and dangerous than the former, we ſhould always be exceedingly cautious of having recourſe to the common expedient of breaking the membranes, which ought never to be done till we be certain the difficulty depends upon this cauſe; and, even then, the head of the child ſhould be well advanced, and the membranes protruded almoſt as far as the os externum. Many inconveniences ariſe from a premature evacuation of the waters; for thus the parts become dry and rigid, a conſtriction of the os uteri for a time enſues, the pains often either remit or become leſs ſtrong and forcing, though not leſs painful and fatiguing; the dilatation goes on ſo ſlow, and the labour becomes ſo ſevere, that the woman's ſtrength and ſpirits, by the unprofitable labour, are quite overcome and exhauſted; ſo that the head remains confined in the paſſage, merely from want of force of pain to puſh it forwards. The woman in the beginning of labour ſhould therefore be treated with the utmoſt delicacy and gentleneſs. The work of nature is too often ſpoiled by officious hands. She ſhould be ſeldom touched while the membranes are whole, leſt they ſhould be ruptured; and, even when touching is neceſſary, this ſhould only be done when the

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the pains begin to remit, and the tenfe membranous bag to relax.

2dly, Too great a quantity of water may prevent the uterus from contracting, and thus weaken the force of the pains. Though this may, however, occafion a delay, it will never be attended with more dangerous confequences; and the fame advice already given will hold equally good in this cafe. that the membranes fhould never be broken till the foft parts be completely dilated; and we are affured that the difficulty or delay proceeds only from this caufe.

3dly, The funis umbilicalis too long. The funis may be faulty from its too great length, or the contrary: thus the extraordinary length, by forming circumvolutions round the child's neck or body, fometimes proves the caufe of protracting the labour. But as this can only happen when the chord is of an uncommon length, there is generally enough left to admit of the exit of the child with fafety; and it is time enough, in general, after the child is born, to flip the noofe over the fhoulders or head: there is feldom occafion to divide the chord in the birth; a practice that may be attended with trouble and hazard.

The practice of introducing a finger in ano, to prefs back the coccyx, or to prevent the head, when it advances, from being retracted by circumvolutions of the chord, is now entirely laid afide; an expedient that can anfwer no end, but that of fretting and bruifing the parts of the mother, and injuring thofe of the child.

Funis too fhort. The funis is fometimes thick and knotty, or preternaturally thickened by difeafe. In this cafe, part of the placenta may be feparated as the child advances through the pelvis, and thus a flooding will enfue; or the funis may be actually ruptured, and occafion the death of the child, if the birth does not quickly follow. Such cafes, however, rarely happen.

An inconvenience, at leaft fully as bad as the former, may arife from the too great length of the funis, though it may depend on other circumftances: *viz*.

4thly, The prolapfus of the funis before the head. In this cafe, the funis, if poffible, fhould be pufhed up above the prefenting part; for, if the labour pains are flow, and the chord becomes cold, or the pulfation in it begins to grow languid, the circulation will thus be interrupted, and the life of the child deftroyed. If the head is far advanced in the pelvis, and the child's life in danger, the delivery may be performed with the forceps. But to pufh up the head, and turn the child with a view to preferve its life, as many author's recommend, is a practice by no means adviseable: we fhould feldom, in this pofition, be enabled to fave the child; and turning under fuch circumftances can never be done but at the immediate hazard of lofing the mother

5thly, Placenta attached towards the cervix or os uteri. This cafe is truly melancholy; for, if the delivery is not fpeedily accomplifhed, the effufion from the uterine veffels will be fo copious and profufe, that the unfortunate woman muft in a very fhort time perifh. On this occafion the delivery muft be conducted in the beft manner the judgment and fkill of the operator can direct, and with as much expedition as the fafety of the mother will admit.

Thus, in moft laborious cafes, provided the woman's ftrength be fupported, the management properly regulated, the natural moifture of the parts when deficient fupplied, manual affiftance very feldom becomes requifite: but as cafes do occur, wherein nature, with all advantages, will fail, and the common methods of relief prove unfuccefsful, recourfe muft be had to more powerful means, while the woman is able to fupport the conflict. In all fuch cafes, the condition of the patient, the ftructure and ftate of the parts, and pofition of the prefenting part of the child, muft very carefully be confidered.

Method of Delivery by Inftruments.

When the powers of nature are infufficient to expel the child, extraordinary affiftance muft be had recourfe to. In laborious births, this is chiefly of two kinds.

I. The head is either extracted as it prefents: or,

II. Its diameter is diminifhed previous to the extraction.

The head may be detained from advancing through the pelvis by all the caufes formerly enumerated.—Thefe are chiefly included in four general ones.

1. Weaknefs in the mother.
2. Narrownefs of the pelvis.
3. The bulk of the head of the child; or,
4. Its difadvantageous pofition.

Whatever is the caufe, when the natural pains begin to remit, and the parts of the woman begin to fwell; when her ftrength declines, her pulfe grows feeble, and there is no profpect of advantage to be gained by delay; meafures muft be taken for affifting the delivery, otherwife both mother and child may perifh from neglect.

As inftruments are never to be employed but in the moft urgent and neceffitous cafes, and exprefsly with a view to preferve the life of mother or child, or both; thofe of a fafe and harmlefs kind fhould always be made trial of, in preference to thofe of a deftructive nature.

Ufe of the Forceps.

The forceps is an inftrument intended to lay hold of the head of the child in laborious births, and to extract it as it prefents. This inftrument, as now improved, in the hands of a prudent and cautious operator, may be employed without doing the leaft injury either to mother or child.

In every obftetrical cafe, wherein manual affiftance becomes neceffary, the contents of rectum and bladder fhould, if poffible, be previoufly emptied.

The membranes alfo fhould be broken, the foft parts completely dilated, and the head of the child as far as poffible advanced, previous to the ufe of any inftrument.

The form and ftructure of the parts of the woman, the fituation and progrefs of the prefenting part of the child, muft at this time be carefully confidered. The concavity of the facrum, for inftance, will determine the progrefs of the labour. The touch of the vertex, fontanella, lambdoidal, or fagittal future, the fore or back

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back part of the ear, or some part of the face, will ascertain the true presentation of the child.

The lower the head is advanced in the pelvis, our success with the forceps is the more to be depended on. For when it has proceeded as far as the inferior aperture, by means of this instrument it may be readily relieved: but when the head of the child is confined at the brim, both the application of instruments, and the extraction by this means, are exceedingly difficult and dangerous.

The head may be so firmly wedged in the pelvis, that the forceps can neither be introduced nor fixed without bruising or tearing the parts of the woman: whatever, therefore, insurmountable difficulties occur, either in applying or extracting with the forceps, the life of the mother must not be endangered by fruitless efforts: the head of the child must immediately be opened, and the delivery accomplished without further delay.

In laborious births, the proper forcep-cases may be reduced to two, which include, however, a considerable variety. These are,

I. The smooth part of the cranium.

II. The face, presenting.

The head may present,

1st, Naturally, when low advanced in the pelvis, with the vertex to the pubes, and the forehead or face in the hollow of the sacrum. Or,

2dly, When higher in the pelvis, the vertex may present with the face laterally, the ears to the pubes and sacrum. Or,

3dly, The fontanel may present with the face to the pubes and vertex to the sacrum; or with the vertex to the pubes and face to the sacrum.

1. When the head presents naturally. The woman in this case must be placed on her back a-cross the bed, properly supported; the accoucheur, seated before or in a kneeling posture, after gradually lubricating the perinæum and vagina, must proceed gently to stretch the parts, by passing the hand in a conical manner through the os externum vaginæ, pushing it forwards by the side of the child's head, till it advances as far as an ear, if possible: along this hand he is to guide a blade of the forceps, which with the other hand he introduces in the direction of the line of the pelvis, holding the handle backwards towards the perinæum, and keeping the clam closely applied to the child's head. This must be insinuated very gradually by a kind of wriggling motion, pushing it on till the blade is applied along the side of the head over the ear; he must then gently withdraw the first hand from the pelvis, with which he must secure the handle of the blade of the forceps already introduced, till the other blade be passed along the other hand, in the same slow cautious manner: the handles must then be brought opposite to each other, carefully locked, and, lest they slip in extracting, properly secured by tying a fillet or garter round them; but this must be loosed during the remission of pulling, to prevent the brain from being injured by the pressure The extraction must be made by very slow and gentle degrees, and with one hand only, while the other is employed to guard the perinæum: the motion in pulling should be from blade to blade; the accoucheur must rest from time to time, and, if the pains are not gone, should always in his efforts only co-operate with those of nature. The child and mother will suffer less by going on in this gradual manner than by precipitating the birth, which can never be done but at the risk of destroying both. If, in making the extraction, the forceps slip, they must be cautiously withdrawn blade by blade, and again introduced in the same manner.—When the tumor of the perinæum forms, and the vertex begins to protrude at the os externum, the accoucheur must rise from his seat, raise the handle gently upwards, and, by a half-round turn, bring the hind-head from under the symphysis or arch of the pubes; remembering carefully to guard the perinæum from laceration and its consequences, to which it is now so greatly exposed.

In attempting the introduction of either blade, if it meets with any interruption, it must be as often withdrawn, and pushed up again in a proper direction, till every difficulty be surmounted; and if, from the smallness or contriction of the parts, the introduction of the second blade shall seem impracticable, the former one must be withdrawn, and the latter must be first introduced.

2. The vertex may present with the face laterally in the pelvis. It is always difficult to apply the forceps till the bulky part of the head has passed the brim; and here it is not only difficult to the operator, but extremely hazardous to the patient, to introduce this instrument till the ear of the child has got under the pubes. When the ears thus present to pubes and sacrum, the woman should be placed on her side or knees; the most difficult blade of the forceps should be first applied, which is the one under the pubes; when both are passed, and properly secured, the patient should again be turned to her back, before the operator attempts to extract, and the head in this case (as the quarter-turn can seldom be made with safety) should be delivered in the manner wherein it presents; because, when confined any time in the passage, its figure is altered by the overlapping of the bones, in such a manner that it passes along, in general, with far less difficulty than to attempt to push up and make the mechanical turns; a work often altogether impracticable, by which contusion or laceration of the parts of the woman, and the most fatal consequences, may be occasioned. The handles of the forceps must here particularly be well pressed backwards towards the perinæum, that the clams may humour the curvature and intrusion of the sacrum, and accommodate themselves to the form of the child's head.

This is a case wherein the forceps often fail; if so, they will sometimes succeed by varying the mode of application, and fixing them over the forehead and occiput; if this method fails also, the size of the head must be diminished, and the extraction made with the blunt hook or crotchet.

3. The fontanella may present with the face to the pubes. This is the most common of the fontanel cases; though sometimes the face is lateral in the pelvis, sometimes diagonal, and sometimes it is turned to the sacrum. The true position is ascertained by the direction of the fontanel, and that of the ear. Here, as in other laborious births, nature should be intrusted as long as we dare. The head does not always de-

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fcend mechanically through the capacity of the pelvis, as fome practitioners have fuppofed; nor will the deviation from its ordinary mode of defcent always of itfelf influence the delivery, at leaft very rarely in fuch a manner as to require extraordinary affiftance. In whatever manner the head prefents, when it is fituated high in the pelvis, the delivery cannot be effected without difficulty or hazard; in fuch circumftances, the application of the forceps will frequently baffle the utmoft efforts of the accoucheur, and the confequences of fuch attempts may prove fatal to mother and child.

When extreme weaknefs in the mother, floodings, convulfions, or other urgent fymptoms, render it neceffary to force the delivery, whether the face be to pubes or facrum, the forceps may be applied along the ears, in the fame manner as directed in a natural labour; and the head, for the reafons already given, fhould be brought along in the manner it prefents: the extraction fhould be made with great deliberation, that the parts of the woman may have time to ftretch; the perinæum muft be carefully fupported; the forceps muft be gently releafed, when the head is delivered; and the reft of the delivery conducted as in a natural labour.

In this cafe, when fituated high in the pelvis, the fontanel prefenting, and the face either to pubes or facrum, the long axis of the head interfects the fhort diameter of the pelvis, and very often, though the forceps be applied, and a firm hold of the head be obtained, it is not poffible to bring it along with all the force we dare exert. If this method therefore fails, the common forceps fhould be cautioufly withdrawn, and the long ones applied, if poffible, over the forehead and occiput, when the fize of the head, by the compreffion it fuffers in paffing along, being perhaps fomewhat diminifhed, the extraction will be fuccefsfully performed. This method alfo failing, previous to the operation of embryotomy, Dr Leak's forceps, with the third blade, may be had recourfe to. But of this little can be faid with confidence, till the inftrument has been more generally employed. From the difficulty of fucceeding in the application of the common forceps, it may, *à priori*, be concluded, that the introduction of a third blade, even in the hands of an expert practitioner, however ingenious the invention, is an expedient not eafily to be put in practice. Neither is Roonhuyfe's lever, or a blade of the forceps paffed up between the pubes and fore-head or hindhead of the child, in order to procure the delivery of the head, to be recommended in fuch cafes: however fome have boafted of its fuccefs, it is an inftrument that may do much mifchief; and few practitioners can ufe it with fafety.

II. *Face prefenting.*—Of laborious births, face-cafes, as we have already obferved, are the moft difficult and the moft dangerous. From its length, roughnefs, and inequality, the face muft occafion greater pain; and from the folidity of the bones, it muft yield to the propelling force with much more difficulty, than the fmooth moveable body of the cranium. Face-cafes are the moft troublefome that occur in the practice of midwifery, and in which the moft expert practitioners may be foiled in their attempts; and thefe attempts, if too early exerted, will be followed in many inftances with fatal confequences. Whatever way the face prefents, it fhould be allowed to advance as low as poffible in the pelvis; by which means the accefs will be more eafy, and the pofition, for the application of inftruments, more favourable. In this aukward fituation, much mifchief may be done by rafhnefs; whereas, if time be allowed, and the patient be properly fupported, the delivery will generally end well.

The face may prefent with,

1. The chin to the pubes.
2. to the facrum.
3. laterally.

From the difficulty of applying inftruments in thefe cafes, fome authors recommend, as an univerfal practice, to turn the child, and deliver by the feet. But this in general is a dangerous practice, and feldom or never advifeable, except when the membranes remain entire, till the os uteri is completely dilated, and the head continues loofe about the brim of the pelvis; and even then the propriety of the practice is doubtful; becaufe if the head is fmall, or the pelvis be well proportioned, the face will defcend without much difficulty; and if otherwife, befides the rifk in attempting to turn, the child may be loft from the preffure of the chord, or the difficulty of extracting the head after the delivery of the body.

When affiftance becomes neceffary, the beft practice in face-cafes is the following: Having placed the patient in a convenient pofture, let the accoucheur in the gentleft manner pafs his hand within the pelvis; and, during the remiffion of pain only, endeavour to raife the head of the child, fo that he may pufh up the fhoulders entirely above the brim of the pelvis, and thus change the pofition of the face: by this means, if fuccefsful, he will be able to reduce the firft of thefe cafes, fo as to make the fontanel prefent with the face to the pubes; he will reduce the fecond fo as to bring down the vertex, with the face to the facrum; and the third he will reduce to a vertex cafe, with the face lateral. The delivery may be afterwards trufted to nature; which failing, there is eafier accefs for the application of inftruments to make the extraction, as already directed. The fuccefs, however, of the accoucheur, in altering the pofition of the head, by pufhing it up, will entirely depend on the time he is called; for, fhould the head be firmly wedged in the pelvis, no force he dares employ will be fufficient to alter the pofture.

If therefore every attempt to reduce the face, and make the vertex or fontanel prefent, fhall prove unfuccefsful, and fymptoms are urgent, the forceps muft be applied over the ears of the child, and the extraction performed in the beft manner the operator is able. And, failing thefe, immediate recourfe muft be had to the crotchet.

1. In the firft cafe, previous to the introduction of the forceps, the chin, if poffible, fhould be advanced below the pubes.

2. In the fecond, the chin fhould be advanced to the inferior part of the facrum. And,

3. In the third, the chin fhould be as low as the hinder part of the tuber ifchii: and although in general the head is to be extracted as it prefents, if the operator meets with confiderable refiftance, it muft be gently pufhed up and turned with the chin, either laterally,

terally, below the pubes, or into the hollow of the facrum, according to the particular circumftances of the cafe, and in a direction beft accommodated to the form and diameter of the pelvis.

Ufe of the Sciffars, Crotchet, and Blunt Hook.

When the head of the child, from its fize, unfavourable pofition, or from a fault in the pelvis, cannot be protruded by the force of natural pains, nor extracted by the forceps, recourfe muft be had to more violent means, and the life of the child muft be deftroyed in order to preferve that of the mother. This operation was by the ancients called *embryotomy*.

When the head, from its extraordinary bulk, is detained at the brim of the pelvis; on evacuating the contents, the bones of the cranium immediately collapfe, and the head is afterwards propelled by the force of the labour pains; failing which only, the extraction muft be made with the blunt-hook or crotchet.

The unfavourable pofition of the head is of itfelf a caufe infufficient to juftify the ufe of deftructive inftruments, which ought never to be employed but in extreme cafes, after every milder method has failed. From the difficult accefs to the cranium in order to make a perforation and evacuate the brain, a face-cafe makes a very troublefome and dangerous crotchet one. Very luckily, in narrow pelvifes, the face rarely prefents, and very feldom advances far in that direction; at other times, the pofition may be fo altered, that the crown, the back of the ear, or fome other part of the cranium, can be reached; otherwife the crotchet muft be fixed in the mouth, orbit of the eye, &c. and the head brought along in that direction, till the fciffars can be employed to open the fkull.

But the grand caufe of difficult labour is, the narrownefs or diftortion of the pelvis. For when, at the brim, inftead of four inches and a quarter from pubes to facrum, it meafures no more than one and a half, one and three-fourths, two, or two inches and one-fourth, the ufe of inftruments becomes abfolutely requifite, and very frequently in thofe of two inches and one-half, and three inches; or when the diameters through the capacity, or at the inferior aperture, are retrenched in the fame proportion, difficulties will in like manner arife, and the delivery, except the labour be premature, or the child of a fmall fize, cannot be accomplifhed without the affiftance of deftructive inftruments.

We judge of the form of the woman; by the progrefs of the labour; by the touch. When the fault is at the inferior aperture, the touch is pretty decifive; *e. g.* if a hump is felt in the os facrum inftead of a concavity; if the coccyx is angulated; if the fymphyfis pubis projects inwards in form of an acute angle; if the tuberofities of the ifchia approach too near each other: or the one tuber be higher than the other; fuch appearances are infallible marks of a diftorted pelvis. But when the narrownefs is confined to the brim, this is only to be difcovered by the introduction of the hand within the pelvis: the projection of the lumbar vertebræ over the facrum, is a fpecies of narrow pelvis that moft frequently occurs in practice. In this cafe, the child's head, by the preffure it fuftains between the pubes and facrum, is moulded into a conical or fugar-loaf form, the parietal bones are fqueezed together, over-lapping one another, and will be felt to the touch when the labour is advanced, like an acute ridge, fomething in the form of a fow's back.

Inftead of the complicated inftrumental apparatus invented by the ancients, fuch as fcrews, hooks, &c. for fixing in, laying hold of, and extracting the head, as it prefented, an operation in many cafes difficult and dangerous, when the head was bulky or the pelvis narrow, as the woman frequently loft her life in the attempt; the practice of diminifhing the fize of the head, by opening the cranium and evacuating the brain, previous to the extraction, is a modern improvement, and an important one: the inftruments for this purpofe confift fimply of a pair of long fciffars, a fharp curved crotchet, and a blunt hook: thefe are preferable to every other, whether of ancient or modern conftruction.

When the accoucheur is under the difagreeable neceffity of deftroying the child to preferve the mother, fhe muft be laid in the fame pofition as already advifed for the application of the forceps; and the fame rules, recommended for the one operation, will in general apply to the other.

Thus, in the narroweft pelvis that occurs, previous to opening the cranium, the foft parts fhould be completely dilated, and the head of the child fhould be fixed fteadily in the pelvis and advanced as far as poffible; for while the head is high and loofe above the brim, the application of inftruments is very difficult as well as hazardous.

The long fciffars muft be cautioufly introduced into the vagina, directed by the hand of the accoucheur; the points muft be carefully guarded, till they prefs againft the cranium of the child, which they muft be made to perforate with a boring kind of motion, till they are pufhed on as far as the refts; they muft then be opened fully, carefully re-fhut, half turned, and again widely opened, fo as to make a crucial hole in the fkull. They muft afterwards be pufhed beyond the refts, opened diagonally again and again, in fuch a manner as to tear and break to pieces the bones of the cranium; they muft then be fhut with great care; and withdrawn along the hand, in the fame cautious manner as they were introduced, left they fhould bruife or tear the uterus, vagina, or any other part of the woman. After a free opening in the cranium has thus been made, the brain muft be fcooped out with the fingers or blunt-hook, and the loofe fharp pieces of bone muft be carefully feparated and removed, that no part of the woman be tore while the head is extracting. The teguments of the fcalp fhould now be brought over the ragged bones of the cranium, and the woman fhould be allowed to reft an hour or two, according to her ftrength and other circumftances: the bones of the cranium will now collapfe; and if the woman has as much ftrength remaining, or the pelvis be not much diftorted, the head being thus diminifhed, will be protruded by the force of natural pains: otherwife it muft be extracted, either by means of two fingers introduced within the cavity of the cranium, by the blunt-hook introduced in the fame manner, guarding the point on the oppofite fide while making the extraction; or, failing thefe, by the crotchet, which, though dan-

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dangerous in the hands of an ignorant rash operator, may be employed by the prudent practitioner with as much safety as the bluntest instrument.

The method of introduction is the same with a blade of the forceps. The chief thing to be attended to is, to guard the point till it be applied against the head, and firmly fixed in its hold, which should always be somewhere on the outside of the cranium: provided a firm hold is obtained, no matter where, behind the ears, about the os petrosum, orbits of the eyes, maxilla inferior, &c. according to the presentation of the head. The woman being properly secured, and the handle of the instrument covered with a cloth, the operator must then pull, at first gently, afterwards more forcibly, resting from time to time, and endeavouring to make the extraction in the best manner the circumstances of the case will admit of. If the pelvis be much distorted, so that, by means of the utmost strength the accoucheur can exert, little purchase is made, he may apply to the opposite side a blade of the forceps, which are now so constructed as to lock with the crotchet; let him then bring the handles together, secure properly, and thus endeavour to make the extraction. Should this expedient also fail, the blade of the forceps must be withdrawn, the other blade of the crotchet must be applied, the handles brought together and secured, and the extraction made, moving from blade to blade.

Should the head present in such a manner, that, in attempting to extract it, the crotchet divides the vertebræ of the neck, and the head is thus severed from the body, an accident that can only happen in the hands of an ignorant blundering practitioner; the head must be pushed up above the brim of the pelvis, the crotchet or blunt hook must be fixed under the axilla, the arms must be brought down, and the body extracted, by fixing the crotchet below the scapula on the sternum, or among the ribs; the head must afterwards be extracted in the manner already advised: or should the head in extracting be pulled from the body, as may happen when the child has been long dead, or when it is putrid, the delivery of the body must be effected by means of the crotchet as now directed; a method preferable to that of turning, as some advise.

If the head, instead of yielding to the force of pulling, be at last cut and broken in pieces, the operator must endeavour to bring down an arm of the child, to fix the crotchet about the jaw or neck, pull at both holds, and thus attempt to make the extraction; this also failing, he must bring down the other arm, fix the crotchet in the thorax, and, in a word, must tear the child in pieces, that the delivery may be accomplished by any means.

In face-cases, where it is impracticable to alter the position, and when the pelvis is much distorted, the double crotchet is sometimes requisite; the handles must be well secured, kept well backwards towards the perinæum, and the motion always from blade to blade. It very seldom, however, happens, that there is occasion for the double crotchet: by this means the head is flattened in pulling; whereas if one blade only can be employed, the head is lengthened, and, in pulling, can better accommodate itself to the shape of the pelvis as it passes along.

Preternatural Labour.

Chap. III. *Preternatural Labour.*

In whatever manner the child presents when the body is delivered before the head, the birth is accounted preternatural.

Preternatural labours may be referred to one of the four following classes.

I. When one or both feet, knees, or the breech, present.

II. When the child lies across in a rounded or oval form, with the arm, shoulder, side, back, or belly, presenting.

III. When one or both of the upper extremities present, the child lying in the form of a sheath, the feet towards the fundus uteri, the waters evacuated, and the uterus strongly contracted round the body of the child.

IV. Lastly, Premature or flooding cases, or others in which it may be necessary to force the delivery, either previous to the rupture of the membranes, or quickly after it.

The causes of cross labours most commonly assigned by authors are, The obliquity of the uterus; circumvolutions of the funis umbilicalis round the child's body; the shortness of the funis, or attachment of the placenta towards the fundus uteri; shocks affecting the mother when pregnant, &c. The position of the fœtus may also be influenced by its own motion and stirrings, by the particular form and bulk of its body, by the manner of stretching of the uterus, by the quantity of liquor amnii, and by many other circumstances.

The symptoms that indicate an unfavourable position of the child, before it can be discovered by the touch, are very uncertain and fallacious: a cross birth may, however, be suspected,

1st, If the pains be more slack and trifling than ordinary.

2dly, If the membranes be protruded in a long form like a gut, or the finger of a glove.

3dly, If no part of the child can be discovered when the uterine orifice is considerably opened.

4thly, If the presenting part through the membranes be smaller, feels lighter, and gives less resistance than the bulky ponderous head.

5thly, Lastly, after the rupture of the membranes, if the meconium of the child be passed along with the waters, it is a sign that the breech presents, or that the child is dead.

Preternatural labours are difficult or hazardous, according to,

1. The form of the pelvis, and general health and constitution of the woman.

2. The bulk of the child, and its manner of presenting.

3. The time the waters have been evacuated, and the uterus contracted round the body of the child.

4. When complicated with plurality of children; the prolapsis of the funis umbilicalis; the limbs of the child entangled with the chord; profuse and violent flood-

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floodings from the attachment of the placenta towards the cervix uteri, &c

Turning is often laborious, and always dangerous in proportion to the force used in searching for and bringing down the feet; though, in general, the difficulty and hazard are not so great, as in many cases strictly called *laborious*, when the head presents; the treatment of preternatural labours being better known, and for the most part easier put in practice.

Each class of the general division of cross labours includes a variety of different cases. By considering a few of every class, a general idea of the whole will be formed.

CLASS I.

CASE I. The simplest and easiest case is the Agrippan posture, when the child presents with the feet.

The foot is to be distinguished from the hand, first, by the weight and resistance it gives to the touch; secondly, by the shortness of the toes; thirdly, by the projecting heel.

When the feet present in the passage, the labour should be allowed to go on as if natural. If the child be of an ordinary size, the woman in health, the parts well proportioned, in the way of assistance nothing further seems necessary but the application of a warm cloth round the body of the child, which must be properly supported till it advances as far as the pains are able to force it. If the size be ordinary, or rather small, it will sometimes make the mechanical turns, and be entirely pushed along by the force of the natural pains; but it generally stops at the shoulders, after the breech protrudes without the os externum, where the resistance is so great, that the accoucheur's assistance becomes requisite.

In this case, the patient must be placed on her back, properly supported; the hand of the accoucheur must be cautiously introduced; the parts of the woman must be gently stretched; the feet of the child must be laid hold of, and brought as low in the vagina as possible; a soft warm cloth must be wrapped round them, and the extraction must be performed in a slow cautious manner, making large motions in a circular or lateral direction, resting from time to time, if the pains are gone; and if not, always waiting for the natural efforts. When advanced as far as the breech, the body, if not already in a proper direction, must be pushed up, and gently turned with the face towards the mother's back; and to make sure that the face turns with the body, or to prevent the chin, vortex, or shoulders, from catching on the pubes, or angle of the sacrum, an extraordinary quarter-turn more must be made: this must be reversed previous to the extraction; and the difficulty arising from the obstruction of the shoulders must be removed in the following manner: While the breast and legs of the child are supported over the palm and fore-arm of the one hand of the accoucheur, which he draws towards one side, he must introduce two fingers of the other hand at the opposite side into the vagina, over the back part of the shoulder, as far as the elbow, and endeavour in the most gentle manner to bring down the arm, always remembering in his movements to humour the natural motions of the joint: he must then shift hands, when the other arm is to be relieved in the same manner: both arms being brought down, the woman must now rest a little, when a pain or two generally follows, and the head is also forced along. But should the woman be much exhausted, and if the head does not quickly advance, the child may be lost from delay. The extraction of the head in preternatural labours is often the most difficult and the most dangerous part of the delivery; the cause of resistance, when it does not advance, is chiefly owing to its confinement between the angle of the sacrum and pubes, when the bulky part of the head is detained at the brim; whether the resistance be here or towards the inferior aperture of the pelvis, if the head does not advance in a pain or two, the extraction must be made in this manner: While the right hand of the accoucheur supports the body of the child below, with two fingers pressing on either shoulder, the left hand and fingers must in the same manner be placed over the back of the neck, and pulling gently in the direction from pubes to sacrum, he must thus endeavour to bring it along: but, should the pelvis be narrow, or the child's head of a large size, or the face be laterally or anteriorly placed in the pelvis, or, what rarely happens, the os uteri contracted round the neck of the child; in either of these cases, the accoucheur will sometimes meet with the utmost difficulty. When the above method therefore fails, he must introduce two fingers of the right-hand into the child's mouth, while those of the left-hand are expanded over the shoulders, as already directed; and in this way he must endeavour to relieve it, pulling from pubes to sacrum, alternately raising and depressing the head till it advances low down, so that the face descends from the hollow of the sacrum, when the accoucheur must rise from his seat, and bring the hind-head from the pubes with a half-round turn, imitating that of a natural labour.

If the position be unfavourable, the face, if possible, should be turned to the sacrum, by pushing up the head, or by pushing back the chin: If the contraction of the uterus is the cause of resistance, which rarely occurs, it must be gently stretched with the fingers. Or if the difficulty arises from circumvolution of the chord round the legs, thighs, body, or neck of the child, these must be disengaged in the easiest manner possible; it is rarely necessary to divide the funis on this account.

Should every method fail in bringing down the head, the delivery must be effected by means of the forceps cautiously passed over the ears, with the handles under the child's body, in a direction downwards towards the perinæum. If the pelvis be very narrow, or the head of a large size, it must be opened by pushing the sciffars through the occipital bone, so that the contents of the cranium may be evacuated, and the extraction made by means of the forceps, blunt-hook, or crotchet. But if the head, by the efforts to extract it, be actually severed from the body, and left behind in the uterus, an accident which sometimes occurs, it must be delivered by inclosing it in the forceps, while secured from rolling by pressing externally on the abdomen. If the forceps cannot be applied, the cranium must be opened, the texture of the brain destroyed, and the extraction performed by the fingers of the accoucheur, by the blunt-hook, or by the crotchet. If the under-jaw remains, the

hed

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head may be effectually fecured till locked in the forceps, or till its bulk be diminifhed, by introducing a finger into the mouth, thrufting it through the jaw under the chin, drawing it down, and paffing a ligature through the perforation.

In cafes where the child has been long dead, fhould the belly or thorax be diftended with air or water, and prove the caufe of obftruction, the contents muft be evacuated by opening with the fciffars, or tearing with the crotchet; and in general, where difficulties occur, the delivery muft be accomplifhed in that manner the circumftances of the cafe will beft admit of.

Cafe 2. When inftead of two, one foot only falls into the vagina, the other is fometimes detained by catching on the pubes, and, if eafily come at, fhould be brought down, always remembering to humour the natural motion of the joint; but, fhould the leg be folded up along the child's body, the attempt is fometimes both difficult and dangerous, and ought not to be perfifted in, as the breech will either be forced down by the affiftance of natural pains, or by gently pulling by one leg only.

Cafe 3. When one or both knees prefent, the delivery muft be conducted in the fame manner with that of the feet.

Cafe 4. When the feet offer along with the breech, this laft muft be pufhed up, while the former are fecured and brought down, till it be reduced to a footling cafe, and otherwife managed as above.

Cafe 5. The breech may prefent with the fore-parts to the mother,

1ft, Anteriorly;

2dly, Laterally; or,

3dly, Pofteriorly.

Sometimes the breech may be difcovered, previous to the rupture of the membranes; but afterwards with more certainty, by the meconium of the child paffed with the waters, and by the touch.

In whatever manner the breech prefents, the delivery fhould be fubmitted to nature, till the child be advanced as far as the thorax, when the feet are to be brought down and laid hold of, the child, if neceffary, pufhed up, the mechanical turns effected; and the delivery otherwife conducted as in a footling cafe. There is much lefs hazard in general, agreeable to an old obfervation of Mauriceau, in allowing the child to advance double, than in precipitating the extraction by pufhing up to bring down the feet before the parts have been fufficiently dilated; a practice difficult and troublefome to the operator; painful, and fometimes dangerous, to the mother; and by which the child is expofed to the rifk of ftrangulation, from the retention of the head after the delivery of the body. If the child be fmall, though doubled, it will eafily pafs in that direction; if large, though the labour be painful, the natural throes are lefs violent and lefs dangerous than the prepofterous help of the accoucheur: If the child thus advances naturally, it will be lefs expofed to fuffer; if it does not advance, the parts of the mother will be prepared for the accoucheur to pafs his hand into the pelvis, to raife up the breech, to bring down one or both feet, and deliver as above.

Weaknefs in the mother, floodings and convulfions, a very large child, or narrow pelvis, the prolapfus of the funis, or its compreffion between the thighs of the child, or between the child and pelvis, by which its life is endangered, if the chord cannot be reduced above the prefenting part, are the only exceptions to the general rule of treating the breech as a natural labour.

The practice of helping forward the breech, by paffing the blunt-hook under the ham, is now entirely laid afide: this can never be done with fafety, till the breech be fo low advanced, that the hand of the accoucheur can be ufed, which may be employed with more advantage as well as fafety.

CLASS II.

In the former clafs of preternatural labours, it is advifeable to truft to nature in many cafes, as the birth will often be accomplifhed without manual affiftance: but when the child lies a-crofs, no force of pain can make it advance in that pofition; and, without proper affiftance, both the mother and child would perifh.

If the accoucheur has the management of the labour from the beginning, the child may be turned, in the worft pofition, without difficulty; but when the waters have been for fome time evacuated, and the uterus ftrongly contracted, turning is laborious to the operator, painful and dangerous to the mother. In fuch cafes, the ancients endeavoured to make the head prefent; but, from its bulk, they often failed, and the attempt was often attended with fatal confequences. The method of delivering by the feet is the moft important modern improvement in the practice of midwifery; an improvement to which many thoufands owe their lives.

When the child lies in a tranfverfe pofition, the accoucheur muft infinuate his hand through the vagina into the uterus in the gentleft manner, fearch for the feet, bring them down with the utmoft caution, and finifh the delivery as in footling-cafes. To effect this, the following rules fhould be obferved.

1. The patient muft be placed in a convenient pofture, that the operator may be able to employ either hand, as the various circumftances of the cafe may require.

2. Though the beft pofture, in general, is laying the woman on her back, it will be fometimes neceffary to turn her to her fide; and, in thefe cafes, where the abdomen is pendulous, where it is difficult to reach the feet, or where they lie towards the fundus uteri, the woman fhould be placed on her knees and elbows.

3. An exact knowledge of the true pofition of the child, and of the ftructure and ftate of the parts, fhould be acquired, before attempting to make the delivery.

4. The orifice of the uterus fhould be enlarged, fo as freely to admit the hand; and the ftronger pains fhould be abated, before any attempt be made to deliver.

5. Should the waters be drained off, the parts dry and rigid, and the uterus contracted round the child, warm oil muft be injected into the uterus, otherwife its rupture may be endangered.

6. In paffing the hand into the uterus, this muft be done

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done in the gentlest manner; the parts must be well lubricated with butter or pomatum; the line of the pelvis must be attended to; the efforts of the operator must be slow and gradual; and thus the utmost rigdity in the soft parts will, in time, be overcome.

7. The hand must be introduced only during the remission of pain; when pain comes, the accoucheur must always rest; otherwise he may push his hand, or the fœtus, through the body of the uterus.

8. In pushing up, to come at the feet, this must never be done with the points of the fingers, nor with the hand clenched, but with the palm of the hand, or the broad expanded fingers, and always during the remission of pain, and the latter should also be observed in bringing down the legs; but, in making the extraction of the body, the efforts of the operator should always co-operate with those of nature.

9. The hand should, if possible, be introduced along the anterior parts of the child; and both feet, if easily come at, should be laid hold of.

10. In turning, the accoucheur should never consider the child as dead, nor allow himself to be deceived by symptoms doubtful and fallacious; the child is sometimes born alive when he would least of all expect it; therefore, in pushing up, bring down the legs, or extracting the body, it should be handled with the greatest delicacy.

11. When the hand is within the pelvis, it should not always be moved in the line of the umbilicus, but rather towards one side of the spine, by which more room is gained, and the prominent angle of the sacrum avoided.

12. The hand should be passed as far as the middle of the child's body, before attempting to search for the feet; or before attempting to break the membranes, should these remain entire, till the aperture of the uterus will admit of the hand.

13. If the hand cannot pass the presenting part of the child to come at the feet, instead of violently pushing back, the part should be as it were lifted up in the pelvis, and moved towards a side; by which means difficulties may be surmounted, and great danger often prevented.

By attending carefully to the above rules, laceration of the uterus, floodings, convulsions, inflammations, and their consequences, may be prevented; accidents that frequently happen in the hands of ignorant rash operators.

Case 1.—*The arm presenting.* The right is to be distinguished from the left by laying hold of the child's hand, in the same manner as in shaking hands; and thus the general position of the child may be judged of.

When the accoucheur is called in early, the reduction is generally practicable; but if the arm protrudes through the vagina, and the shoulder be locked in the pelvis, it is needless, by fruitless efforts, for the accoucheur to fatigue himself, and distress his patient, to attain a point by which he will gain no very material advantage; as the hand can be passed into the uterus by the side of the child's arm, which will, of course, return into the uterus when the feet are brought down into the vagina.

In order to make the delivery, the hand of the accoucheur, well lubricated, must be conducted into the uterus by the side of the child's arm, along the thorax, at the opposite side of the pelvis where the head lies; if any difficulty occurs in coming at the feet, this hand must be withdrawn, and the other introduced in its stead; and if still the hand cannot easily pass beyond the child's head or shoulder, the presenting part must be raised up, or gently pushed to a side, that one or both feet may be laid hold of, which must be brought as low as possible, pushing up the head and shoulders, and pulling down the feet alternately, till they advance into the vagina, or so low that a noose or fillet can be applied; and thus by pulling with the one hand by means of the noose, and pushing with the other, the feet can be brought down and the delivery finished, however difficult.

The method of forming the noose is by passing the two ends of a tape or garter through the middle when doubled; or, should the garter be thick, by making an eye on one extremity, and passing the other end through it: this, mounted on the points of the fingers and thumb of the accoucheur's hand, must be conveyed into the uterus, passed over one or both feet and ankles, and secured by pulling at the other extremity.

Case 2.—*The side.* This is discovered by feeling the ribs.

Case 3.—*The back.* This is discovered by feeling the spine.

Case 4.—*The belly.* This is known by the funis.

These cases occur rarely, as the uterus must with difficulty admit of such positions. When any of these parts do present, the child seldom passes any part of the brim of the pelvis, and is, in general, more easily turned than in several postures in which it may offer. The belly, from the difficulty with which the legs can be bended backwards, except the child be flaccid, putrid, or before the time, will very seldom directly present; if so, it will be early and readily discovered by the prolapsus of the funis, and there will be no great difficulty to come at the feet, and deliver. The rule in all these cases is, to pass the hand into the womb in the gentlest manner possible, and to search for the feet and bring them down.

CLASS III.

When the child lies longitudinally in the uterus, with the arm or shoulder presenting, and the head more or less over the pubes, or laterally in the pelvis, the feet towards the fundus uteri, the waters evacuated, and uterus contracted round the child's body; these are the most difficult and laborious of all the cases of preternatural labours. Here the protruding arm ought, if possible, to be reduced, and the head brought into the pelvis; for unless the child be very small, it is impossible for the head and arm to pass along together.

In order to effect the reduction of the arm, different instruments have been invented; but the hand of the accoucheur is preferable to every thing of this kind, whether of ancient or modern invention. This, conducted by the arm that protrudes, must be insinuated through the vagina into the uterus, as far as the shoulder of the child, which if the accoucheur can raise up, he will generally succeed in reducing the arm

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arm. Should this method fail, he must attempt to push up the fore-arm at the elbow; but, in bending it, must be very cautious, to avoid overstraining or dislocating the joint. In whatever manner the reduction is accomplished, if any method proves successful, the arm must be retained till the head, by the force of natural pain, enters the pelvis, and prevents its return; otherwise the arm will descend as often as it is reduced.

But if the attempts for reduction prove impracticable, the woman must be placed on her knees and elbows, and the accoucheur, with great deliberation, must endeavour gently to slide up his hand between the uterus and child as far in the uterus as possible, to lift up the head and shoulders, and search for and bring down one or both feet, in the best manner the various circumstances of the case will admit of. As soon as they can be laid hold of, they must be gradually brought down into the vagina, so low that the noose can be applied over them, which must be fixed and pulled with the one hand, while the head and upper parts of the body are raised and gently pushed up with the other.

Should the arm have been long protruded without the os externum, much swelled, and cold; the waters drained off; the uterus strongly contracted; and the position of the child such as to render it impracticable, either to reduce the protruded limb or to search for and bring down the feet; the head, if easily come at, must be opened and extracted with the blunt hook or crotchet; or a crotchet must be fixed amongst the ribs, and the breech or feet thus pulled down.

Should the pelvis be very narrow, and unsurmountable difficulties occur, the arm must be twisted off at the elbow, though this expedient is rarely necessary; and the delivery must in general be accomplished as the prudence and judgment of the operator can best direct; always remembering, when one life must fall a sacrifice, that the tree must be preserved at the expence of the fruit.

In this, as in other cases, the swelling and coldness of the arm, and even want of pulsation in the artery, are not infallible signs of the child's death; and should this even be so, it makes little difference in the mode of delivery, unless that it will lead us to pay all our attention to the mother: For a living child gives no more assistance in the birth than a dead one, whatever authors have said to the contrary.

When both arms present, the delivery must be conducted in the same manner as when one only presents. The former case is less difficult than the latter, as the head seldom advances far when both arms fall into the passage, so that they can either be reduced, or there is easy access to come at the feet to bring them down and deliver.

CLASS IV.

When the membranes remain entire, till the soft parts are so much dilated that the hand will readily find admittance; or when the hand can be passed within the cavity of the uterus, immediately after the rupture of the membranes, so that part of the water may be retained; the delivery may be accomplished, in the most troublesome preternatural cases, with the greatest safety and expedition. But when the waters have been long evacuated, and the uterus closely contracted round the body of the child, the case will prove laborious to the operator, painful and dangerous to the mother and child.

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When there is reason to suspect that the child lies across, which can often be ascertained, either by feeling the presenting part through the membranes, or by some of the signs of preternatural labours already mentioned; the woman should be managed in such a manner, that the membranes may be preserved entire as long as possible: for this purpose she should keep quiet in bed, and her posture should be such as is least favourable for straining, or exerting force during the pain: she should be touched as seldom as possible, till the os internum be sufficiently dilated. The accoucheur should then introduce his hand in a conical form, well lubricated, into the vagina, and through the aperture of the internal orifice, insinuating it between the uterus and the membranes, till it advances almost as high as the fundus uteri, when he must break the membranes, by pinching some part of them between a finger and thumb, or by forcibly pushing a finger thro' them; he must then search for, and endeavour to lay hold of, one or both feet, and deliver.

Should the membranes be ruptured in the attempt, he must be ready to run up his hand as quickly as can be done with safety, when, part of the waters by his arm being retained, the operation of turning will be facilitated. Should the placenta adhere on that side of the uterus where the hand is passed, it must again be withdrawn, and the other hand be introduced in the opposite side.

Floodings. It has been already observed, that a flooding seldom proves fatal to the mother before the seventh month of pregnancy; after which period, from its duration or excess, the life of both the mother and child may suffer. Should therefore a flooding attack a woman in the two last months of pregnancy, from whatever cause it may arise, and whether attended with labour-pains or not, if the hæmorrhagy be so considerable that she is ready to sink under it, and that cold applications and other means of checking the evacuation shall fail, the woman must be placed in a proper posture, her frinds prudently apprised of her danger, and the delivery must be immediately performed, by stretching the vagina and os uteri, till the hand of the operator can easily gain admittance to break the membranes, catch hold of the feet, and extract the child.

If it can possibly be prevented, the membranes in flooding cases should never be broken till the aperture of the uterine orifice will freely admit the hand to pass, that, after the evacuation of the waters, the accoucheur may have it in his power either to make the delivery or not according as the effusion continues or abates.

Soon after attempting to stretch the parts, should the labour-pains come on, the waters begin to be collected, and the uterine hemorrhagy diminish, the accoucheur must then withdraw his hand, and manage the delivery according to circumstances. And if, for instance, the child presents naturally, the delivery must be trusted to nature; otherwise, if the flooding continues, or the child presents across, the accoucheur must persist in his work, going on slowly, and with the utmost

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moſt delicacy, till he be able to reach the feet, to bring them down, and deliver; always remembering, during this proceſs, that the ſtrength of the woman, by proper nouriſhment, be ſupported.

But ſhould the placenta adhere to the cervix, or upon the os uteri, the greateſt danger is to be dreaded; for thus the flooding will commence from the moment the os uteri begins to ſtretch, and will increaſe ſo rapidly, that the woman, if not ſpeedily delivered, muſt inevitably ſink under it. The whole body of the placenta, in ſuch caſes, is ſometimes ſeparated when the labour has made but little progreſs; ſo that the woman will often periſh whether delivery be attempted or not. As this, however, is the only expedient by which her life, and that of the child, can be ſaved; in every caſe where the placenta preſents, which the accoucheur will readily diſcover by the touch of the ſoft pappy ſubſtance of that body, he muſt immediately place the woman in a proper poſture, inſinuate his hand gently by the ſide of the protruding placenta, break the membranes, ſearch for the feet of the child, and bring them down, ſo that the delivery may be finiſhed with all poſſible expedition; for, in this unhappy caſe, a few minutes delay may prove fatal.

The after-birth ought never to be extracted before the child, if it can poſſibly be avoided.

After delivery, time ſhould be given for the uterus to contract, that nature may thus throw off the placenta, which never ought to be hurried away, unleſs the continuance or a recurrence of the hemorrhagy render it neceſſary.

Prolapſus of the funis. Difficulties ariſing from the funis falling down into the vagina, and preſenting along with ſome part of the child, may, in this claſs of the diviſion of preternatural labours, be included.

A preſſure on the chord, in ſuch a degree as to interrupt the circulation, muſt infallibly deſtroy the life of the child: hence a coldneſs and want of pulſation in the chord is the trueſt criterion of the death of the child; and hence, in every caſe where the chord is prolapſed before any bulky part of the child, if the delivery be not accompliſhed with expedition, the child will periſh. This is only to be prevented by replacing the chord, and retaining it above the preſenting part, till this laſt, by the force of labour-pains, be ſo far advanced as to prevent the return of the former; or the child muſt be turned and brought by the feet, provided this can be done with ſafety to the mother. But it is often difficult to ſucceed in the attempt of the one or other; and, if the woman has ſtrong pains, ſuch attempts are not to be hazarded, as the conſequences may prove fatal.

When the accoucheur is thus ſituated between two puzzling difficulties, the preference muſt always be given to the mother. If the child be ſmall, and the pelvis well formed, which may be known by the hiſtory of former deliveries, and if the labour goes on quickly, the child will generally be born alive; but if, on the contrary, the child be above the ordinary ſize, and the pelvis rather narrow, turning will prove a dangerous operation to the mother, and there is little proſpect of ſaving the infant by this means.

Beſides our former diviſion of labours, *plurality of children, monſters, extra-uterine fœtuſes*, and the *Cæſarean operation*, are parts of the ſubject that yet remain to be conſidered.

Plurality of Children.

CHAP. IV. *Plurality of Children.*

The caſe of twins often occurs: of triplets ſeldom: of quadruplets rarely: nor is there perhaps a ſingle inſtance, where five or more diſtinct fœtuſes have been found contained in the human uterus, though many ſuch fabulous hiſtories have been recorded by credulous authors.

The ſigns of two or more children, ſuch as the ſudden or extraordinary increaſe of the uterine tumor, motion felt in different parts of the abdomen, &c. are very doubtful and fallacious: this can only be aſcertained after the delivery of one child; and even then a recurrence or continuance of labour-pains is not a certain and infallible criterion; neither is the abſence of pains a ſure indication of the contrary; as many caſes have occurred, where ſeveral days have intervened between the birth of a firſt and ſecond child. The chief ſymptoms to be depended on are, 1ſt, The child being of a ſmall ſize, and the quantity of liquor amnii ſo inconſiderable as not to account for the bulk of the woman in time of pregnancy. 2dly, The bleeding of the funis umbilicalis next the mother. 3dly, The remora of the placenta. 4thly, The uterine tumor not ſenſibly diminiſhed, which, very ſoon after delivery, in ordinary births, will be found gradually ſhifting lower and lower, and will feel at laſt as if a hard circumſcribed tumor like a ball between the umbilicus and pubes. Hence the utility of the general practice of applying the hand externally on the abdomen, in every caſe after delivery; by which an accurate knowledge will be formed of the nature and manner of the uterine contraction. When, from any of theſe circumſtances, there is reaſon to ſuſpect another child, the moſt certain and infallible manner of diſcovering it is, the paſſing of a finger, or the introduction of the hand into the uterus, where another ſet of membranes will be perceived, and probably ſome part of the child preſenting through them.

The poſition of twins or triplets is commonly that which is moſt commodious, and which will occupy the leaſt room in utero: their ſituation is often diagonal; tho' they may preſent in every poſſible poſture. Thus, therefore, the general rules recommended for the delivery of one child, are equally applicable in the caſe of twins, triplets, &c.

It has been the general practice with many, after the birth of one child, to paſs the hand immediately into the uterus, to break the membranes, catch hold of the feet of the child, and thus deliver. But this is certainly bad practice, whatever authors have ſaid to the contrary. If the woman is healthy, and the child preſents favourably, that is, with the head, breech, or feet, natural pains ought to be waited for, when the child will be expelled by the force of theſe only; failing which, manual aſſiſtance, as in other caſes, muſt be had recourſe to.

It very rarely happens, when the firſt birth is preternatural, that the ſecond membranes are ruptured in making the extraction. Should this prove the caſe, the

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limbs of the children may be confounded, fo that a leg and an arm, or three legs, or arms of different children, may prefent; which, however, will make little difference in the mode of delivery; the accoucheur will endeavour to lay hold of the foot or feet moft readily within his reach, and will be cautious, in bringing them down, to make fure they belong to the fame body.

If the child prefents crofs; if floodings, convulfions, or other dangerous fymptoms, fhall take place; if the woman has fuffered much in the firft labour; and if, after feveral hours, a recurrence of labour-pains does not enfue; the hand muft then be introduced into the uterus, the membranes muft be broken, and the child muft be extracted by the feet; or, if the head remains locked in the pelvis, and, from want of ftrength in the woman, cannot be expelled, the treatment is the fame as in other laborious births.

In twin-cafes it may be recommended as a general rule, to avoid precipitating the delivery of the fecond child till the woman fhall have refted a proper time, and till, by the contraction of the fundus uteri, the fecond fet of membranes occupy the place of the firft, and be protruded as far as the os externum; when, and not before, the delivery may fafely be affifted, fhould circumftances occur to render fuch affiftance neceffary: whereas, by breaking the membranes and evacuating the waters when the child lies high in the uterus, a flooding may be brought on, or a fpafmodic conftriction of the uterus round the body of the child may be occafioned, which may render the delivery both difficult and dangerous.

The placentæ of twins, triplets, &c. generally adhere, though fometimes they are diftinct, and may be thrown off at different times after the birth of the different children; fo that the practitioner fhould be on his guard, and never fhould leave his patient till he makes fure there be no more children. When a fecond child is difcovered, no attempts ought to be made to extract the placenta till after the birth of the remaining child or children; as the woman would be fubject to flooding, which might prove of fatal confequence before the uterus could be emptied of its contents.

In cafe of plurality of children, a fecond ligature fhould be applied on the funis, on that end next the mother, immediately after the birth of every child; and a gentle compreffion fhould be made on the abdomen of the woman after the firft delivery, which muft be gradually tightened after every fucceeding one, to prevent the confequences of a fudden removal of uterine preffure, which is to be dreaded where the diftenfion has been confiderable.

The placenta, in fuch cafes, muft be managed in much the fame manner as ufual. In twins, &c. it generally feparates with great facility, provided time has been given for the uterus to contract. Both chords fhould be gently pulled; and when it advances towards the uterine orifice, where, being large and bulky, it commonly meets with confiderable refiftance, it requires the introduction of a finger or two into the vagina for bringing down the edge, after which the body readily follows.

Chap. V. *Monfters.*

These are of various fizes and forms, and, unlefs very fmall, the pofture favourable, and the woman well made, will prove the caufe of a difficult and troublefome delivery. Sometimes a child is monftrous from a preternatural conformation of parts, fuch as a monftrous head, thorax, abdomen, &c. At other times, there is a double fet of parts, as two heads, two bodies with one head, four arms, legs, &c. But fuch appearances very feldom occur in practice; and, when they do, the delivery muft be regulated entirely according to the circumftances of the cafe. A large head, thorax, or belly, muft be opened. If two bodies united together are too bulky to pafs entire, they muft be feparated; the fame of fupernumerary limbs. If the pofture be unfavourable, it muft be reduced when practicable; otherwife the extraction muft be made with the crotchet, in the beft manner the circumftances of the cafe will admit of; always, in cafes of danger or difficulty, giving the preference to the fafety of the mother, without regarding that of the child.

Chap. VI. *Cæfarean Operation.*

Cæfarean Operation.

When the delivery could not be accomplifhed by other means, or when a woman died fuddenly with a living child in her belly, an operation to preferve the life of mother and child in the former cafe, and to fave the child in the latter, has been recommended, and fuccefsfully performed, by different authors, and in different ages.

This operation is of ancient date; it is the *fectio Cæfarea* or *partus Cæfareus* of the Latins, and the *hyfterotomia* of the Greeks. Whether it was ever fuccefsfully performed on the living fubject amongft the ancients feems uncertain; but that it has been fuccefsfully practifed by the moderns on various occafions, and in feveral different countries of Europe, there are fo many authentic hiftories on record, that the fact will fcarce admit of doubt: but as this, like many other falutary inftitutions, has been much abufed, and in many cafes improperly and injudicioufly employed, (for fome of thofe women who furvived the operation, were afterwards fafely delivered of living children), the circumftances which render this operation neceffary demand a very particular inquiry, viz.

1. A narrownefs, or bad conformation of the bones of the pelvis.

2. Imperforated vagina, or contractions in the vagina, cicatrices, tumors, or callofities in the os uteri, &c.

3. The efcape of the child through the uterus when torn.

4. Ventral conceptions.

5. Herniæ of the uterus.

6. The pofition or bulk of the child.

It will be neceffary carefully to examine thefe different caufes, in order to fhow that they are by no means, in every cafe, fufficiently powerful motives for having recourfe to it.

I. Bad conformation of the bones of the pelvis. When the hand of the operator cannot be introduced within the pelvis; or, in other words, when its largeft diameter does not exceed one inch, or one inch and a half, this conformation is perhaps the only one which renders the Cæfarean operation abfolutely neceffary: happily, however, fuch a ftructure very feldom occurs in practice; and when it does, the accoucheur will readily

readily difcover it, by attending to the following circumftances, and to the common marks of a narrow pelvis. Wherever the capacity of the pelvis is fo ftrait as not to admit any part of the child's head to enter, nor two fingers of the accoucheur's hand to conduct proper inftruments to tear, break down, and extract the child piece-meal; in this cafe, recourfe muft be had to the Cæfarean fection; an expedient, though dreadful and hazardous, that will give the woman and child the only chance of life; and which, if timely and prudently conducted, notwithftanding of the many inftances wherein it has failed, may be performed with fome probability of fuccefs.

It is true, the fuccefs of the operation in the city of Edinburgh, where it has been done five times, has proved difcouraging, as none of the women had the good fortune to furvive it many days. This, however, is not the fault of the operation, but is to be imputed to the low, weak ftate of the patients at the time, who had previoufly been feveral days in labour, and their ftrength greatly exhaufted, before the operator was called. Delivery by every other means was utterly impracticable; the operation, though the event was doubtful, alone gave a chance of life; and three of the children by this means were extracted alive.

Mr Hamilton furgeon and profeffor of midwifery in Edinburgh, having been an eye-witnefs of the operation the laft time it was performed here, gives the following account of the cafe which fell under his obfervation.

Elifabeth Clerk, aged 30, had been married for feveral years, became pregnant, and mifcarried in the third month; the expulfion of the abortion occafioned fo fevere a ftrefs, as actually to lacerate the perinæum. Some time after her recovery, fhe was irregular, afterwards had one fhow of the menfes, again conceived, and the child, as fhe imagined, arrived at full time. She was attacked on Monday the 3d of January 1774, about midnight, with labour-pains, which went on flowly, gradually increafing till Saturday the 15th, when fhe was brought from the country to the Royal Infirmary here. Upon examination, the pelvis feemed confiderably diftorted; but the body was otherwife well fhaped, though of fmall fize; the os externum vaginæ was entirely fhut up, nor could any veftige of vagina be obferved, nor any appearance of labia pudendorum: inftead of this, there was a fmall aperture at the fuperior part of the vulva, immediately under the mons veneris, probably about the middle anterior part of the fymphyfis pubis. This aperture (which had a fmall procefs on the fuperior part, fomewhat refembling the clitoris) was no larger than juft to allow the introduction of a finger; the meatus urinarius lay concealed within it; a confultation of furgeons was called, and the Cæfarean fection was determined on. Having had no ftool, nor voided any urine for two days, an injection was attempted to be thrown up; but it did not pafs, nor was it poffible to pufh the female catheter into the bladder. Mr William Chalmer was the operator in this cafe. At fix in the evening, he made an incifion on the left fide of the abdomen in the ordinary way, through the integuments, till the peritonæum was expofed; two fmall arteries fprung, which were foon ftopped by a flight compreffion: the wound was then continued through the peritonæum into the cavity of the abdomen, when the bladder appeared flightly inflamed, much diftended, reaching with its fundus near as far as the fcrobiculus cordis: another unfuccefsful attempt was made to pafs the female catheter; at length a male catheter was procured, which was, after fome difficulty, introduced into the bladder, and the urine evacuated to the quantity of above four pounds, high-fmelled and fetid. This occafioned a neceffary interruption for a few minutes, between making the opening into the abdomen and uterus; the bladder collapfing, the uterus, which before lay concealed, now came in view, through which an incifion was made, and a ftout male child was extracted alive; and immediately afterwards the fecundines. The uterus contracted rapidly. After cleanfing the wound, the lips were brought together by the quill-future, and dreffed fuperficially. The patient fupported the operation with furprifing courage and refolution; nor was there more than five or fix ounces of blood loft on the occafion.

Being laid in bed, fhe complained of ficknefs, and had a flight fit of vomiting; but, by means of an anodyne, thefe fymptoms foon abated: fhe was affected with univerfal coldnefs over her body, which alfo abated on the application of warm irons to the feet: fhe then became eafy, and flept for four or five hours. Next morning, the 16th, about two o'clock, fhe complained of confiderable pain in the oppofite fide, for which fhe was blooded; and an injection was given, but without effect; for the pain increafed, ftretching from the right fide to the fcrobiculus cordis; nor did fomentations feem to relieve her; her pulfe became frequent, fhe was hot, and complained of drought. At 7 A. M. the injection was repeated, but with no better fuccefs; and eight ounces more of blood were taken from the arm; a third injection ftill failed to evacuate any fæces: the drought increafed; and the pulfe rofe to 128 ftrokes in a minute. At 11 A. M. the pulfe became fuller; and the refpiration much oppreffed. No ftool nor urine paffed fince the operation. At 12 fhe was blooded again, when the fizinefs appeared lefs than formerly. She now took a folution of *fal Glauber. manna and cr. tart.* at fhort intervals; fhe vomited a little after the laft dofe, had a foft ftool, and voided a fmall quantity of urine. At 3 P. M. her pulfe was 136, and fhe had another ftool, when thin fæces were evacuated; fhe was then ordered two fpoonfuls of a cordial anodyne mixture every fecond hour: the vomiting now abated; the pulfe became fmaller and more frequent; fhe paffed urine freely; but the pain and oppreffed breathing increafed. At feven P.M. her pulfe rofe to 142, and became weak and fluttering; fhe called for bread, and fwallowed a little with fome difficulty; her drought was intenfe; the dyfpnœa ftill increafed. She was now much oppreffed, and began to tofs; the pulfe funk and became imperceptible; fhe complained of faintifhnefs, but on belching wind her breathing was relieved, and the pulfe returned, growing fuller and ftronger: the pain of the fide ftill increafing, 12 ounces of blood, very fizy, were taken away; and two glyfters of warm water with oil were injected without effect: at 8 P. M. the pulfe became lefs frequent and fmaller; fhe complained much of the pain towards the fcrobiculus cordis: her breathing was much oppreffed; her belly was tenfe, and fwelled as big

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big as before the operation; her pulfe was now fmall and feeble; fhe looked ghaftly; and expired a little after eight, 26 hours after the operation.

It is to be regretted that the relations would not permit the body to be opened.

Since the firft certain accounts of the operation fuccefsfully practifed by a fow-gelder on his own wife, in the beginning of the 16th century, there are on record above 70 well-attefted hiftories, wherein it has been fuccefsfully performed: for, of all the cafes related by authors, it has not proved fatal to the patient above once in ten or nine inftances; which evidently fhows the propriety of the practice, and probability of fuccefs, both in regard to the mother's own recovery, and for certainly preferving the life of the child. But it fhould never be attempted, excepting in thofe cafes only where it is abfolutely impoffible to deliver the woman by any other means whatever; for there are pelvifes to be met with, where, without having recourfe to this operation, both mother and child muft inevitably perifh: fuch have occurred to many practitioners, who, from want of refolution or from ill-founded prejudice, have allowed their patients to perifh from neglect, contrary to a well-known maxim in phyfic, That, in a defperate cafe, it is better to employ a doubtful and even defperate remedy, than to abandon the patient to certain and utter ruin. Such, for inftance, is a cafe related by Saviard, of a girl aged 27, whofe ftature was only three feet, who came to lie-in at Paris, in the *Hotel Dieu;* every method but the operation was in vain attempted; both mother and child died. Mauriceau alfo relates the hiftory of a woman who was left to die, where the aperture of the pelvis was fo fmall as not to admit the hand of the accoucheur. And, not to multiply inftances, Mr De la Roche gives a cafe where the woman had been feven days in labour; the child was faved by the operation; but the woman died the fifth day after, probably from its being too long delayed: the diftance, in this fubject from the lower vertebra lumborum and os pubis, was no more than two fingers breadth. The operation, when the neceffity is evident, ought therefore to be early performed, that the patient, who from her make and conftitution is generally delicate and puny, may have every chance of recovery in her favour, without being exhaufted by the fruitlefs efforts of a tedious and painful labour, as too often has been the cafe. On thefe occafions, the prudent accoucheur fhould call in the advice of his elder brethren of the profeffion, and, by his cautious and prudent conduct, avoid every caufe of cenfure or reproach.

Exoftofes from the bones of the pelvis is a fpecies of deformity very rarely met with in practice, and which feldom or never takes place to fuch a degree as to render this operation neceffary.

II. Conftriction, callofity, tumors, &c. about the vagina or os tincæ. The vagina and os tincæ are often affected with conftrictions from cicatrices, with callofities and tumors; but it is feldom, if ever, neceffary to perform the Cæfarean fection on this account. Tumors in the vagina may generally be removed with fafety, even after the commencement of labour, and delivery happily fucceed; or it may be fometimes practicable for the accoucheur to pafs his hand by the fide of the tumor, to turn the child, and deliver. With regard to conftrictions in the vagina, and callofities in the os uteri, there are many inftances where, at the commencement of labour, it was impoffible to introduce a finger into the vagina; yet the parts have dilated as labour increafed, and the delivery terminated happily. At other times, the dilatation has begun during pregnancy, and been completed before delivery. There is a hiftory, for inftance, in the *Mem. de l'Acad. des Scienc.* 1712, of a woman whofe vagina was no larger than to admit a common writing quill; fhe had been married at 16, and conceived 11 years after: towards the fifth month of her pregnancy, the vagina began to dilate, and continued to do fo till full time, when fhe was fafely delivered. Guilemeau dilated, and La Mott extirpated, callofities in the vagina and os tincæ, when the children were fuccefsfully expelled by the force of natural labour.

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Harvey relates a cafe where the whole vagina was grown together with cicatrices; nature, after a tedious labour, made the dilatation, and a large child was born.

La Mott mentions his having delivered three women, who had not the fmalleft veftige of an orifice through the vagina to the uterus. Dr Simpfon cut through a callofity of an os uteri which was half an inch thick, &c.

Upon the whole, tumors in the vagina, or about the orificium uteri, may be fafely extirpated without danger of hemorrhagy or other fatal fymptoms, and the delivery will happily fucceed: and if the vagina be impervious, the os externum fhut up, or the labia grown together, the parts fhould be opened with the fcalpel, rather than rifk an operation, at beft in the iffue doubtful and precarious: an operation never allowable in fuch cafes, and therefore univerfally improper in difeafes or malconformation of the foft parts of generation. If the os externum be entirely clofed, if the cavity of the vagina be entirely filled up, or the paffage confiderably obftructed by tumors, callofity, or conftriction from cicatrice, and there is no reafon to fufpect a fault in the pelvis, of which a judgment may be formed by the common marks of deformity, under fize, or a rickety habit; it is by much the beft practice to open a paffage through the vagina, and deliver the woman in the ordinary way. If there be no defect in the pelvis, the head of the child, or any other bulky part that prefents, will advance in this direction, till it meets with a refiftance in the foft parts: thus the teguments will at length be protruded before the child's head, in form of a tumor, when a fimple incifion downwards to the perinæum, in the direction of the anus, will remove the caufe of difficulty, by relieving the head; the child will afterwards fafely pafs, and the wound will heal without any bad confequence.

The ftate of the pelvis, and progrefs of the labour in thefe cafes, may often be learned by the touch of the finger in ano.

III. Lacerated uterus is another caufe for which this operation has been recommended. The uterus may be ruptured from violence in making the delivery; or fuch an accident may happen naturally, either from the crofs prefentation of the child in time of pregnancy, or in time of labour, when the pelvis is narrow: thefe cafes are generally fatal; and it is very feldom, if

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if ever, that the life of the mother can be ſaved by the Cæſarian ſection, after the fœtus eſcapes through the torn uterus into the cavity of the abdomen: becauſe it often happens, that inflammation and ſphacelus has affected the parts of the uterus that ſuſtained the preſſure previous to the rupture; or, if otherwiſe, convulſions or other fatal ſymptoms ſoon enſue, from the quantity of blood, waters, &c. poured into the cavity of the abdomen.

When the child cannot be extracted by the natural paſſages, tremors, ſingultus, cold ſweats, ſyncope, and the death of the mother, for the moſt part, ſo quickly follow, that it will at leaſt ſeem doubtful, to a prudent humane practitioner, how far it would be adviſeable, after ſo dreadful an accident, the woman apparently in the agonies of death, raſhly to perform another dangerous operation, even with a view to preſerve the child, till he had waited till the mother recruits or expires.

If part of the child be contained within the uterus, and the feet can be reached, the practice is to deliver by the orifice of the womb: but when the whole fœtus has eſcaped entirely without the uterus, the Cæſarean operation is recommended as the only means of preſerving both mother and child.

If the operation on this occaſion be ever allowable, it may be aſked,

1. At what time muſt it be performed?

2. Would it not have the appearance of inhumanity to have recourſe to this expedient immediately after the uterus burſts, when the woman is ſeemingly ready to expire, although it be the only time when there is a chance of ſaving the child?

3. In moſt caſes where this accident happens, ſhould the Cæſarean ſection be made, is it not highly improbable that the mother will ſurvive ſo terrible a laceration?

4. For if it be done with a view to ſave the mother, in what manner is the extravaſated blood, &c. to be evacuated from the cavity of the abdomen?

What ſeems to make caſes of this kind unfavourable, when the accident happens in time of labour, is,

1mo, That here the parts before rupture in moſt caſes are in a gangrenous ſtate.

2do, As the rupture is commonly towards the cervix, there is generally a much greater hemorrhagy, by reaſon of the ſlow contraction of the uterus at this place.

3tio, The uncertainty, whether, or how long, the patient will ſurvive it, ſeems alſo a conſiderable obſtacle to the operation under ſuch diſagreeable circumſtances, *Ne occidiſſe videatur, quem ſors interemit.*

IV. Ventral conceptions is a fourth indication for this operation. Theſe are either in the ovaria, tubes, or cavity of the abdomen, and ſeldom arrive at great ſize; or are retained, very often a long time, without occaſioning much complaint. The iſſue of theſe conceptions has alſo been no leſs various than extraordinary; for after being retained for a great many years in an indolent ſtate, at length abſceſſes or ulcerations have formed, and they have been diſcharged through all the different parts of the abdomen.

Moſt women feel pain and violent motion at the time of ordinary delivery in theſe caſes of ventral conception; if therefore the operation be ever neceſſary, now is the proper time to perform it. But in general, as the ſeparation of extra-uterine fœtuſes from their involucra may occaſion immediate death in many caſes, from the vaſt hemorrhagy that might enſue from the non contractile power of the parts to which they adhere; unleſs they point outwardly, or excite the moſt violent ſymptoms, they ought univerſally to be left to nature.

V. Herniæ of the uterus are ſeldom or never ſufficient to induce us to perform the Cæſarian ſection, as the uterus is very rarely influenced in ſuch a manner, that the orifice cannot be reached, and the delivery ſucceſsfully made. Many inſtances are to be found among ſurgical authors, where deliveries, under ſuch circumſtances, have been happily performed, without having recourſe to ſo hazardous an expedient. Thus Mauriceau mentions a caſe, where the uterus, in a ventral hernia, was puſhed along with the inteſtines above the belly, and contained in a tumor of a prodigious ſize; the woman, however, was delivered at the end of her time in the ordinary way. La Mott relates the hiſtory of a woman in a preternatural labour, whoſe uterus and child hung down pendulous to the middle of her thigh, but whom, notwithſtanding, he ſafely delivered: and Ruyſch gives a caſe where the midwife reduced the hernia before delivery; although it was prolapſed as far as the knee, the delivery was ſafely performed, and the woman had a good recovery.

Laſtly, The poſition or bulk of the child.

Since the practice of turning the child and delivering by the feet, and the late improvement of obſtetrical inſtruments, this operation is never to be performed on account of poſition, monſtroſity, or any other obſtacle on the part of the child.

Upon the whole, when the pelvis is faulty to ſuch a degree, that no inſtrument can be conducted to tear and extract the child, this perhaps is the only caſe wherein this operation ſhould be performed on the living ſubject. Inciſions through the teguments of the abdomen to extract extra uterine fœtuſes, or bones of fœtuſes, do not properly fall under the name of *Cæſarean ſection*, as that name implies inciſion of the uterus alſo.

When a woman advanced in pregnancy dies ſuddenly, either by accident or by natural diſeaſe, the Cæſarean ſection is recommended as an expedient to preſerve the life of the child. This is a very proper meaſure, provided the death of the mother be aſcertained; but ſometimes it is a very nice and difficult point to diſtinguiſh between a deliquium and death; and therefore the accoucheur on ſuch an occaſion muſt act with the utmoſt circumſpection. If the operation be delayed but a very ſhort while after the mother expires, it will probably be in vain to make the attempt; for, whatever fabulous ſtories may be related to the contrary, there are few authentic caſes of the fœtus of any animal ſurviving the mother, perhaps an hour; and therefore every thing ſhould be in readineſs to extract the child with all poſſible expedition, after the event of the mother's death. But, in ſuch caſes, the agonies of death often perform the part of labour, and the child is ſometimes thrown off *in articulo mortis*; or the os uteri is ſo much dilated, that there is eaſy acceſs to paſs the hand, turn the child, and deliver. Thus one ſhould be very cautious in having recourſe to this opera-

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operation, even in the above circumftances; which fhould never be done,

1. Till the death of the mother be afcertained beyond doubt;

2. Till the ftate of the os uteri be examined;

3. Till the confent of the relations be obtained; And,

Laftly, It need not be undertaken, except where the mother dies fuddenly, between the 7th and 9th month.

It is unneceffary where the difeafe has been lingering; in fuch cafes the child commonly dies before the mother.

When it is doubtful whether the child be alive or not, it may be determined by applying the hand on the abdomen of the mother about the time of, and for a little while after, her death, when the life of the child will be difcovered by its motions and ftruggling.

Thus having pointed out the different caufes that determine this operation, it may be obferved, that it is a frightful and hazardous one; and although performed fuccefsfully in a number of cafes, yet, in many others, it has failed, and the woman has died either immediately or foon after. It fhould never, therefore, be undertaken but on extraordinary and defperate occafions; and then it is not only advifeable, but incumbent, on every practitioner to whom fuch cafes occur.

To conclude, it may not be improper to give a few directions with regard to the method of performing the operation on the living fubject.

Having emptied the bladder, and evacuated the contents of the inteftines with repeated emollient glyfters; the patient being encouraged, with proper cordials, and every other requifite in readinefs, fhe muft be placed on a table or bed, with her left fide gently raifed with pillows or bolfters, and properly fecured by affiftants. An incifion muft be made with a common convex fcalpel, beginning rather below the navel at the middle fpace between it and the fpine of the os ilium, carrying it obliquely forwards towards this bone, fo that the wound in length may exceed fix inches. This external wound is to be carried through the common teguments of the abdomen till the peritonæum is expofed, when the operator fhould reft a little, till the hemorrhagy be entirely abated. He muft then, with great caution, make a fmall opening through this membrane, introduce his finger, and upon this a fcalpel (which is preferable to fciffars), and with great expedition make a complete dilatation; he muft now wipe away the blood with a fponge, prefs the omentum or inteftines gently to a fide, if in the way, and endeavour to difcover to what part of the uterus the placenta adheres, that it may be avoided in making the incifion. This may eafily be known by a thicknefs and folidity in the part, which diftinguifh it from the reft of the uterus; it is ftill more eafily difcovered when the membranes are entire. The blood-veffels are lefs in number, and fmalleft in the middle and anterior part of the uterus, which therefore, if the placenta does not interfere, is the proper place for making the incifion, which muft be performed with the utmoft attention, left the child fhould be wounded: if the membranes are entire, more freedom may be ufed, and *vice verfa*. The direction and length of the wound of the uterus muft be the fame with the external one. The child muft now be quickly extracted, and the placenta carefully feparated: thefe muft be given to an affiftant, who will divide the chord, and take care of the child, as the operator's attention muft be wholly beftowed on the mother. The coagulated blood, &c. being removed by a fponge wrung out of warm water (left the uterus or inteftines be protruded, which are very troublefome to reduce), the lips of the external wound muft be quickly brought together, and retained by an affiftant till fecured by a few ftitches; generally three will be fufficient: as many needles fhould be ready threaded with pretty large broad ligatures; the middle ftitch ought to be made firft; the needle fhould be introduced at a proper diftance, *i.e.* about an inch and one-fourth from the fide of the wound, carrying it firft from without inwards, and then from within outwards, fecuring with a double flip a knot, to be ready to untie, left violent tenfion or inflammation fhould enfue; under the knot a foft comprefs of lint, fharpee, or rolled plafter, fhould be applied, and the whole dreffings muft be fecured by a proper comprefs and bandage. The patient muft be afterwards treated in the fame manner as after lithotomy, or any other capital operation.

Quæritur, To what caufe is the unfuccefsful event of this operation to be imputed? When the operation proves fatal, to what immediate caufe are we to afcribe the death of the patient? Is it nervous, or uterine irritation, from cutting, that kills? Is it internal hemorrhagy, or the extravafation of fluids into the cavity of the abdomen? Or are not the fatal confequences rather to be imputed to the accefs of the air on the irritable vifcera? This can only therefore be prevented by expofing thefe parts for as fhort a fpace of time as poffible. Dr Monro, the prefent anatomical profeffor at Edinburgh, in making experiments on young fmall animals, fuch as bitches, cats, frogs, &c. by opening the cavity of the abdomen, and tying the biliary ducts, remarks, that though a large opening into the abdomen be made by incifion, if the wound be quickly clofed and ftitched, the animal will recover, and no bad confequences follow; but if expofed a few minutes to the air, dreadful pain foon comes on, which the creature expreffes by the fevereft agonies; convulfions at laft enfue, and death within four or fix hours after the operation. On opening the abdomen after death, the whole vifcera are found to be in an inflamed ftate, and univerfally adhering to one another. He has often repeated the experiment, and the fame appearances as often take place.

May not the analogy here juftly apply to the human fubject? And, in performing the Cæfarean operation, fhould we not be very careful that the vifcera be expofed as little as poffible, and that the wound be covered with the utmoft poffible expedition?

Chap. VII. *Of the Section of the Symphyfis.*

M. Baudelocque, as has already been obferved, condemns this operation; and, from what he has advanced, apparently with reafon. As no theory, however, can be looked upon as thoroughly eftablifhed until it be

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be confirmed by experience, this gentleman has collected together a number of the principal *facts* relating to this subject. He supposes, that unless it has been successful in saving both the life of the woman and child, the cutting of the symphysis of the pubes cannot by any means be said to have answered its purpose. It is not sufficient that the child has shown some signs of life at its birth, and that the mother has survived for some time. In this respect the Cæsarean operation has the advantage of it, as it always saves the life of the child, and it is very rare for the woman to sink under it immediately. He is of opinion, that there is scarcely one of the cases of this operation, the relation of which may not be justly contested, or solid objections raised against it; either because the operators have been deceived with regard to the dimensions of the pelvis and of the child's head, or because they have greatly exaggerated the advantage gained by the separation of the bones.—The first and most remarkable instance of success in this operation is of a woman named *Souchot;* but though it is not denied that the woman was delivered, and recovered after the operation, yet it has been said by those who take the contrary side, that there was no necessity for performing it. It is certain that this woman had been delivered four times before; in all of which cases the child was killed. M. Baudelocque does not enter into the merits of this question: he considers only what advantage could possibly be gained by it.

"Whatever degree of separation (says he) took place between the ossa pubis after the section of the symphysis, it must have augmented the size of the passage; that is an incontestable fact: but how much did it enlarge in the direction in which it was originally too narrow? The solution of this problem would be easy, if we knew the dimensions of Souchot's pelvis as well as we know those of her child's head. According to the estimation made of it by the physicians who performed the operation, the diameter of the pelvis was only two inches and a half in the direction from the pubes to the sacrum superiorly, and that of the child's head was just three inches and a half. The excess of the latter was consequently one inch, as well as the amplitude to be procured to the former. A separation of two inches and a half between the ossa pubis, the greatest which it was then thought could be obtained, not being able to give more than six lines to the diameter of the pelvis in the aforesaid direction, they thought to make the remaining surplus of the head pass into the separation between the bones; and, moreover, they had the precaution to make the partial protuberances pass successively through the strait, in order to get another line by that means; so that by this system, the section of the pubes produced a result of 13 lines at least, considering it relatively to delivery. Notwithstanding this ingenious calculation, and this great product, the passage was still found narrow enough to give some obstruction to the child's head, and to endanger its life.

"It seems evident that this plan was not formed till after the execution; and that they have only sought to explain what they must have done according to the opinion which they entertained that the diameter of the child's head was an inch larger than that of the pelvis, and not according to what they did and observed: because no one had yet determined the product of a separation of two inches and a half between the ossa pubis, with respect to the different diameters of the pelvis, and particularly respecting that which goes from before backward; because they did not measure the separation as they affirm they did, neither in the case of *Souchot* nor in any other; because the accoucheurs of that woman were then agitated, *much agitated*, as they have publicly confessed; lastly, because this great product, and those sage calculations which we admire in their history of it, were not then necessary. Though they have allowed but two inches and a half to the small diameter of the superior strait, other accoucheurs equally skilful have assigned it six lines more; and they were not deceived if they considered it a little diagonally, as the smallest diameter of the child's head always presents; that is to say, from one of the sides of the projection formed by the base of the sacrum to the symphysis of the pubes."

Our author now goes on to show at great length, that the pelvis of the woman in question was less out of proportion than had been represented; that only two lines of enlargement were necessary, and no more than two were obtained. In like manner, he says, that all the other women upon whom M. Sigault operated were equally well formed excepting one named *Vespres.* This woman died after passing five days in great agony. The ossa pubis were separated about an inch and an half; and in consequence of this separation, the sacro-iliac symphyses were plainly injured, as well as the neighbouring parts. On inspecting the body, these were found open, with the periosteum separated from them: there was also a collection of purulent matter of a dark grey colour, extending very far into the cellular tissue of the left iliac fossa, &c.

In this case, both the mother and her child perished; and M. Baudelocque looks upon it to be sufficient to show the inefficacy of the operation: and he tells us, that out of five women whom Sigault delivered in this way, one died, and four of the children; but M. le Roy, a more successful operator, out of an equal number saved all the children. In a case related by this gentleman, the ossa pubis are said to have separated two inches; and by parting the thighs, an opening of near three inches was obtained: but in this case again, M. Baudelocque controverts the measurements of Le Roy. Another woman named *Du Belloy*, on whom the operation was performed, began to walk on the tenth day after; and this seems to be almost the only case against which M. Baudelocque has not some objection. He mentions, however, an experiment performed on the body of a woman who had died on the 11th day after the Cæsarean operation had been performed in the linea alba. The body was œdematous, which rendered the case more favourable; and a dead child was placed in the belly, after taking out the uterus. The pelvis was only 20 lines in the small diameter, and four inches and a quarter in the transverse. The diameter of the child's head was but three inches five or six lines from one parietal protuberance to the other; the trunk was thin, and every part of the body had been pressed and kneaded, to restore as much as possible the suppleness which death had taken away. An attempt was then made

Section of the Symphysis.

to bring the child through the pelvis by pulling its feet; but it was found impossible thus to disengage it farther than the breast. The symphysis of the pubes was then laid bare by an incision of two inches and an half; preserving, below, the anterior commissure of the *labia pudendi;* and above, an extent of 18 or 20 lines under the inferior angle of the Cæsarean operation. The ossa pubis separated at first no more than nine lines; which opening was augmented as gradually as possible to 21 lines by separating the thighs, and afterwards it was farther increased to two inches and an half by pulling the hips. It was next attempted to bring away the head, which had spontaneously placed itself in the most advantageous situation: but, though several gentlemen of the profession employed their strength successively at the trunk, and on the lower jaw with two fingers in the mouth, it did not advance a single line; nor would it pass the strait until M. Baudelocque seconded those efforts by pressing on the head with one hand placed in the belly, and by compressing it strongly in the direction of its thickness. At the instant when it cleared the strait, the inferior angle of the incision in the teguments tore to the vulva; and the wound was so lengthened towards that of the Cæsarean operation, that those three openings were very near making but one. The sacro-iliac symphyses, which were already a little open, and the ligaments and periosteum ruptured by the time that the ossa pubis were separated 21 lines, now gave way entirely, and with so much noise as to be distinctly heard by every one of the assistants. The ossa pubis, after the passage of the head, remained at the distance of three inches from each other; the angle of the right os pubis was two inches and six lines from the centre of the projection of the sacrum, and the angle of the left os pubis only two inches and three lines; so that the diameter of the pelvis was augmented seven lines in one way and ten in the other.

From this experiment, M. Baudelocque concludes, that very little advantage can be expected from the operation where the pelvis presents only 18 or 19 lines, or even 21 superiorly, such as was the pelvis of Belloy. We must observe, however, that we cannot argue with propriety from a dead to a living subject: though if the measurements are wrong, as our author *afterwards* says, although at first he "had nothing particular to object" to her case, the whole argument in favour of the operation must fall to the ground.

Objections of a similar kind are made to every other case which M. Baudelocque relates: And as it is impossible for those who were not acquainted with the parties to judge of the propriety or impropriety of the operation, we shall content ourselves with describing from M. Baudelocque the appearances met with in the body of a woman who had died in the operation. "The left *labium* was very much swelled and livid; the sacro-iliac symphyses were of a brownish colour to the extent of an inch at least, on account of the blood extravasated under the periosteum which was detached from them; they were overflown with a purulent and ichorous discharge, more abundant on the left side than the right; and which sprung from the bottom of them, through several openings, which were so many rents, whenever the ossa ilia were moved and pressed towards the sacrum; the left symphysis was open five lines, and the right only three: a gangrenous abscess was seen on the right side behind and above the acetabulum, which extended to the anterior and inferior part of the uterus, where there was an eschar of the same nature; an ulcer also gangrenous, and in form of a chink, was observed in the posterior part of that viscus, from the upper part of its neck to the insertion of the ligament of the ovarium, and it penetrated into its cavity. The diameter of the pelvis was two inches and a half from the pubes to the base of the sacrum; five inches from one side to the other; and four and an half from one acetabulum to the sacro-iliac junction of the opposite side. The section had been made on the left os pubis, which was cut clean, and without the smallest notch."

From these, and a number of other examples which our limits will not allow us to insert, our author deduces the following conclusions.

"Though the section of the pubes has been thought more simple, more easy, and certain, than the Cæsarean operation, at a time when experience had not yet demonstrated the difficulties it might present, and the dangers that might follow it, ought we to think the same of it at present? How many times already has it been necessary to have recourse to the saw to separate the ossa pubis? and how often has it not been found impossible to procure any distance between them after the separation? How often has this operation produced a free passage for the child, whose preservation ought necessarily to enter into the plan of the operator, as well as that of the mother, and constitute a part of its success?

"This new operation will appear more simple and less painful than the Cæsarean, if we only consider the extent of the incision, and the nature and importance of the parts concerned in it: that is an indisputable fact. It is only the teguments and the fat which is divided, at most only two inches and an half, and the symphysis of the pubes; there are usually only small vessels cut, incapable of furnishing much blood, and the instrument does not touch the uterus; the child comes into the world by the way that nature intended, and which the section of the pubes renders more or less accessible; there is no considerable hæmorrhagy to be feared, nor those extravasations of milky and purulent matter which almost always mortally injure the interior viscera which they fall upon; there are no absolute difficulties in the execution of this operation but what arise from the intimate consolidation of the bones; and it no way exposes women to subsequent hernias which have been so frequently seen after the Cæsarean operation: this is the idea which its partisans have had of it, and which the greater part of them still entertain.

"But the section of the pubes seldom procures the child an easy exit; for hitherto the greater part have died in the passage, or have been victims, a few minutes after their exit, to the efforts necessary to effect it. When the separation of the ossa pubis has been made, it has not always been possible to remove them from each other, on account of the consolidation of the ilia with the sacrum; and this case, which does not seem to be exceedingly rare, and which cannot be known till after the operation, renders it fruitless, and cannot dispense us from the Cæsarean operation.

Section of the Symphysis.

"If we reflect ever so little on the danger to which the child is exposed in a preternatural labour, where we are obliged to bring it by the feet, and on the small number that then escape death, when the mother's pelvis has not, pretty nearly, all its natural dimensions, we discover another source of accidents which accompanies the section of the pubes; and which we doubtless should diminish, if we could commit the expulsion of the child to the contractions of the uterus, or take hold of the head with the forceps, as some practitioners have already done: but, except in that very small number of cases, the child has always been extracted by the feet whether the head presented or not

"Though this operation very seldom secures the child's life, even when the pelvis is not excessively deformed, it is not then always exempt from the severest consequences to the mother. The death of both is certain when that deformity is extreme. The consequences of a spontaneous separation of the ossa pubis, and of the ossa ilia and sacrum, in some natural or laborious labours, long since announced those which might be expected from this new operation; the example of Vespres, those of the fifth woman on whom M. le Roy performed it, the fourth by M. Cambon, that at Arras, at Dusseldorp, at Spire, at Lyons, at Gênes, that by M. Riollay, by M. Matthiis, &c. have proved that it was not without cause that those accidents were dreaded. A devastation in the external parts and the neck of the uterus; an inflammation and gangrene of that viscus; collections of purulent, sanious, and putrid matter, in the cellular tissue of the pelvis; a hernia of the bladder between the ossa pubis; echimoses along the psoæ muscles; injury to the canal of the urethra; incontinence of urine, and gangrenes more or less profound, &c. form the group of accidents of which this new operation is susceptible. Granting that those of the Cæsarean operation are as formidable for the mother, at least it presents a certain resource, exempt from every danger, for the child. Which of the two operations, therefore, ought to be preferred?

"Even if we could, without inconveniences to the woman, obtain a separation of two inches and an half between the ossa pubis after the section of their symphysis, the Cæsarean operation would still be the sole resource in cases of extreme deformity of the pelvis; the section of the pubes cannot enter into comparison with it, except when the small diameter of the superior strait shall have, at least, an extent of two inches and an half. Though I suspended my judgment, at the time I published my first edition, concerning the preference to be given to one of these two methods, in the latter case, till I could procure more positive information of the innocence or danger of so considerable a separation; though I required that men who had no interest in vaunting this new method to the detriment of the former; in one word, that its adversaries should have seen a separation of two inches and an half, without a rupture of the sacro-iliac symphyses, and without inconveniences to make me adopt this new operation; at present, better informed on all these points, I am not afraid to reject it, and to affirm that no one has ever separated the ossa pubis two inches and a half without destroying the life of the woman. It has had no success but when it has been performed on pelvises at least two inches three quarters in the small diameter, and when the separation has been limited to much less than the point to which they fancied it was carried; in those cases, in fact, where it was absolutely useless; the pelvis being larger still, for I have found it to be more than three inches in some of the women. The section of the pubes cannot at present maintain any comparison with the Cæsarean operation; at most, it might be substituted for the forceps, in some particular cases only: for it cannot, without great inconveniences, give the pelvis an increase of more than two lines from the pubes to the sacrum superiorly; and that instrument may, without danger, reduce the diameter of the child's head as much. But what practitioner would prefer a new operation, which seems to be surrounded by rocks on every side, to one that has been crowned with a thousand successes? If we allow the former any advantages, they would never be more evident than in that species of locked head mentioned by Roederer, where we cannot (says he) introduce any instrument between the head and the pelvis, at whatever part we attempt it; in that case, it would merit a preference over opening the cranium, the use of the crotchets, and the Cæsarean section proposed by the same author: it would be preferable also, in cases where the inferior strait is contracted transversely, provided that a small separation were sufficient to give that diameter the necessary extent."

Part III. Of DISORDERS subsequent to DELIVERY.

Chap. I. *Of the general Management of Women after Delivery.*

The woman being delivered of the child and placenta, let a soft linen-cloth, warmed, be applied to the external parts; and if she complains much of a smarting sorness, some pomatum may be spread upon it. The linen that was laid below her, to spunge up the discharges, must be removed, and replaced with others that are clean, dry, and warm. Let her lie on her back, with her legs extended close to each other; or upon her side, if she thinks she can lie easier in that position, until she recovers from the fatigue: if she is spent and exhausted, let her take a little warm wine or caudle, or, according to the common custom, some nutmeg and sugar grated together in a spoon: the principal design of administering this powder, which among the good women is seldom neglected, is to supply the want of some cordial draught, when the patient is too weak to be raised, or supposed to be in danger of retchings from her stomach's being overloaded. When she hath in some measure recovered her strength and spirits, let the cloths be removed from the parts, and others applied in their room; and, if there is a large discharge from the uterus, let the wet linen below her be also shifted, that she may not run the risk of catching cold.

Management after Delivery.

When the patient is either weak or faintish, she ought not to be taken out of bed, or even raised up to have her head and body shifted, until she is a little recruited; otherwise she will be in danger of repeated faintings, attended with convulsions, which sometimes end in death. To prevent these bad consequences, her skirt and petticoats ought to be loosened and pulled down over the legs, and replaced by another well warmed, with a broad head-band to be slipt in below, and brought up over her thighs and hips: a warm double cloth must be laid on the belly, which is to be surrounded by the head-band of the skirt pinned moderately tight over the cloth, in order to compress the viscera and the relaxed parietes of the abdomen, more or less as the woman can easily bear it; by which means the uterus is kept firm in the lower part of the abdomen, and prevented from rolling from side to side when the patient is turned: but the principal end of this compression is to hinder too great a quantity of blood from rushing into the relaxed vessels of the abdominal contents, especially when the uterus is emptied all of a sudden by a quick delivery. The pressure being thus suddenly removed, the head is all at once robbed of its proportion of blood, and the immediate revulsion precipitates the patient into dangerous lypothymia.

For this reason the belly ought to be firmly compressed by the hands of an assistant, until the bandage is applied; or, in lieu of it, a long towel, sheet, or roller, to make a suitable compression: but for this purpose different methods are used in different countries, or according to the different circumstances of the patients. The head-cloaths and shift ought also to be changed, because with sweating in time of labour they are rendered wet and disagreeable. Several other applications are necessery, when the external or internal parts are rent or inflamed; misfortunes that sometimes happen in laborious and preternatural cases. We shall conclude this chapter with giving some necessary directions with regard to air, diet, &c.

Although we cannot remove the patient immediately after delivery into another climate, we can qualify the air so as to keep it in a moderate and salutary temper, by rendering it warm or cold, moist or dry, according to the circumstances of the occasion. With regard to diet, women, in time of labour, and even till the ninth day after delivery, ought to eat little solid food, and none at all during the first five or seven: let them drink plentifully of warm diluting fluids, such as barley-water, gruel, chicken-water, and teas: caudles are also commonly used, composed of water-gruel boiled up with mace and cinnamon, to which, when strained, is added a third or fourth part of white wine, or less if the patient drinks plentifully, sweetened with sugar to their taste: this composition is termed *white caudle;* whereas, if ale is used instead of wine, it goes under the name of *brown caudle.* In some countries, eggs are added to both kinds; but, in that case, the woman is not permitted to eat meat or broths till after the fifth or seventh day: in this country, however, as eggs are no part of the ingredients, the patient is indulged with weak broth sooner, and sometimes allowed to eat a little boiled chicken. But all these different preparations are to be prescribed weaker or stronger, with regard to the spices, wine, or ale, according to the different constitutions and situations of different patients: for example, if she is low and weak, in consequence of an extraordinary discharge of any kind, either before or after delivery, or if the weather is cold, the caudles and broths may be made the stronger; but if she is of a full habit of body, and has the least tendency to a fever, or if the season is excessively hot, these drinks ought to be of a very weak consistence, or the patient restricted to gruel, tea, barley and chicken-water, and these varied according to the emergency of the case.

Her food must be light and easy of digestion, such as panada, biscuit, and sago; about the fifth or seventh day she may eat a little boiled chicken, or the lightest kind of young meat; but these last may be given sooner or later according to the circumstances of the case and the appetite of the patient. In the regimen as to the eating and drinking, we should rather err on the abstemious side than indulge the woman with meat and strong fermented liquors, even if these last should be most agreeable to her palate; for we find by experience that they are apt to increase or bring on fevers, and that the most nourishing and salutary diet is that which we have above prescribed. Every thing that is difficult of digestion, or quickens the circulating fluids, must of necessity promote a fever, by which the necessary discharges are obstructed, and the patient's life endangered.

As to the article of sleeping and watching, the patient must be kept as free from noise as possible, by covering the floors and stairs with carpets and cloths, oiling the hinges of the doors, silencing the bells, tying up the knockers, and in noisy streets strowing the pavement with straw; if, notwithstanding these precautions, she is disturbed, her ears must be stuffed with cotton, and opiates administered to procure sleep; because watching makes her restless, prevents perspiration, and promotes a fever.

Motion and rest are another part of the nonnaturals to which we ought to pay particular regard. By tossing about, getting out of bed, or sitting up too long, the perspiration is discouraged and interrupted; and in this last attitude the uterus, not yet fully contracted, hangs down, stretching the ligaments, occasioning pain, cold shiverings, and a fever: for the prevention of these bad symptoms, the patient must be kept quiet in bed till after the fourth or fifth day, and then be gently lifted up in the bed-cloaths, in a lying posture, until the bed can be adjusted, into which she must be immediately reconveyed, there to continue, for the most part, till the ninth day; after which period women are not so subject to fevers as immediately after delivery. Some there are who, from the nature of their constitutions, or other accidents, recover more slowly; and such are to be treated with the same caution after as before the ninth day, as the case seems to indicate: others get up, walk about, and recover, in a much shorter time: but these may some time or other pay dearly for their foolhardiness, by encouraging dangerous fevers; so that we ought rather to err on the safe side than run any risk whatsoever.

What next comes under consideration is the circumstance of retention and excretion. We have formerly observed, that, in time of labour, before the head of the child is locked into the pelvis, if the woman has not had an easy passage in her belly that same day, the rectum and colon ought to be emptied by a glyster

Flooding.

glyſter, which will aſſiſt the labour, prevent the diſagreeable excretion of the fæces before the child's head, and enable the patient to remain two or three days after, without the neceſſity of going to ſtool. However, ſhould this precaution be neglected, and the patient very coſtive after delivery, we muſt beware of throwing up ſtimulating glyſters, or adminiſtering ſtrong cathartics, leſt they ſhould bring on too many looſe ſtools, which, if they cannot be ſtopt, ſometimes produce fatal conſequences, by obſtructing the perſpiration and lochia, and exhauſting the woman, ſo as that ſhe will die all of a ſudden; a cataſtrophe which hath frequently happened from this practice. Wherefore, if it be neceſſary to empty the inteſtines, we ought to preſcribe nothing but emollient glyſters, or ſome very gentle opener, ſuch as manna, or *elect. lenitivum.* But no excretion is of more conſequence to the patient's recovery than a free perſpiration; which is ſo abſolutely neceſſary, that unleſs ſhe has a moiſture continually on the ſurface of her body for ſome days after the birth, ſhe ſeldom recovers to advantage: her health, therefore, in a great meaſure, depends upon her enjoying undiſturbed repoſe, and a conſtant breathing ſweat, which prevents a fever, by carrying off the tenſion, and aſſiſts the equal diſcharge of the lochia: and when theſe are obſtructed, and a fever enſues with pain and reſtleſſneſs, nothing relieves the patient ſo effectually as reſt and profuſe ſweating, procured by opiates and ſudorifics at the beginning of the complaints; yet theſe laſt muſt be more cautiouſly preſcribed in exceſſive hot than in cool weather.

The laſt of the nonnaturals to be conſidered are the paſſions of the mind, which alſo require particular attention. The patient's imagination muſt not be diſturbed by the news of any extraordinary accident which may have happened to her family or friends: for ſuch information hath been known to carry off the labour-pains entirely, after they were begun, and the woman has ſunk under her dejection of ſpirits; and, even after delivery, theſe unſeaſonable communications have produced ſuch anxiety as obſtructed all the neceſſary excretions, and brought on a violent fever and convulſions, that ended in death.

Chap. II. *Of violent Floodings.*

All women, when the placenta ſeparates, and after it is delivered, loſe more or leſs red blood, from the quantity of half a pound to that of one pound, or even two; but ſhould it exceed this proportion, and continue to flow without diminution, the patient is in great danger of her life: this hazardous hemorrhagy is known by the violence of the diſcharge, wetting freſh cloths as faſt as they can be applied; from the pulſe becoming low and weak, and the countenance turning pale; then the extremities grow cold, ſhe ſinks into faintings, and, if the diſcharge is not ſpeedily ſtopped or diminiſhed, is ſeized with convulſions, which often terminate in death.

This dangerous efflux is occaſioned by every thing that hinders the emptied uterus from contracting, ſuch as great weakneſs and laſſitude, in conſequence of repeated floodings before delivery; the ſudden evacuation of the uterus; ſometimes, though ſeldom, it proceeds from part of the placenta's being left in the womb; it may happen when there is another child, or more, ſtill undelivered; when the womb is kept diſtruded with a large quantity of coagulated blood: or when it is inverted by pulling too forcibly at the placenta.

After-pains.

In this caſe, as there is no time to be loſt, and internal medicines cannot act ſo ſuddenly as to anſwer the purpoſe, we muſt have immediately recourſe to external application. If the diſorder be owing to weakneſs, by which the uterus is diſabled from contracting itſelf, ſo that the mouths of the veſſels are left open; or, though contracted a little, yet not enough to reſtrain the hemorrhagy of the thin blood; or if, in ſeparating the placenta, the accoucheur has ſcratched or tore the inner ſurface or membrane of the womb; in theſe caſes, ſuch things muſt be uſed as will aſſiſt the contractile power of the uterus, and hinder the blood from flowing ſo faſt into it and the neighbouring veſſels; for this purpoſe, cloths dipped in any cold aſtringent fluid, ſuch as oxycrate, or red tart wine, may be applied to the back and belly. Some preſcribe veneſection in the arm, to the amount of five or ſix ounces, with a view of making revulſion; if the pulſe is ſtrong, this may be proper; otherwiſe, it will do more harm than good. Others order ligatures, for compreſſing the returning veins at the hams, arms, and neck, to retain as much blood as poſſible in the extremities and head. Beſides theſe applications, the vagina may be filled with tow or linen-rags, dipped in the abovementioned liquids, in which a little alum or ſachar-ſaturni hath been diſſolved; nay, ſome practitioners inject proof-ſpirits warmed, or, ſoaking them up in a rag or ſpunge, introduce and ſqueeze them into the uterus, in order to conſtringe the veſſels.

If the flooding proceeds from another child, the retention of the placenta, or coagulated blood, theſe ought immediately to be extracted; and if there is an inverſion of the uterus, it muſt be ſpeedily reduced. Should the hemorrhagy, by theſe methods, abate a little, but ſtill continue to flow, though not in ſuch a quantity as to bring on ſudden death, ſome red wine and jelly ought to be preſcribed for the patient, who ſhould take it frequently, and a little at a time; but above all things chicken or mutton broths, adminiſtered in the ſame manner, for fear of overloading the weakened ſtomach, and occaſioning retchings; theſe repeated in ſmall quantities, will gradually fill the exhauſted veſſels, and keep up the circulation. If the pulſe continues ſtrong, it will be proper to order repeated draughts of barley-water, acidulated with elixir vitriol: but if the circulation be weak and languid, extract of the bark, diſſolved in *aq. cinnamomi tenuis*, and given in ſmall draughts, or exhibited in any other form, will be ſerviceable; at the ſame time, lulling the patient to reſt with opiates. Theſe, indeed, when the firſt violence of the flood is abated, if properly and cautiouſly uſed, are generally more effectual than any other medicine.

Chap. III. *Of the After-pains.*

After-pains commonly happen when the fibrous part of the blood is retained in the uterus or vagina, and formed into large clots, which are detained by the ſudden contraction of the os internum and exter-

num,

Lochia.

num, after the placenta is delivered: or, if these should be extracted, others will sometimes be formed, though not so large as the first, because the cavity of the womb is continually diminishing after the birth. The uterus, in contracting, presses down these coagula to the os internum; which being again gradually stretched, produces a degree of labour-pains, owing to the irritation of its nerves: in consequence of this uneasiness, the woman squeezes the womb as in real labour; the force being increased, the clots are pushed along, and when they are delivered she grows easy.—The larger the quantity is of the coagulated blood, the severer are the pains, and the longer they continue.

Women in the first child seldom have after-pains; because, after delivery, the womb is supposed to contract and push off the clots with greater force in the first than in the following labours: after-pains may also proceed from obstructions in the vessels, and irritations at the os internum. In order to prevent or remove these pains, as soon as the placenta is separated and delivered, the hand being introduced into the uterus, may clear it of all the coagula. When the womb is felt through the parietes of the abdomen larger than usual, it may be taken for granted that there is either another child, or a large quantity of this clotted blood; and, which soever it may be, there is a necessity for its being extracted. If the placenta comes away of itself, and the after-pains are violent, they may be alleviated and carried off by an opiate: for, by sleeping and sweating plentifully, the irritation is removed, the evacuations are increased, the os uteri is insensibly relaxed, and the coagula slide easily along. When the discharge of the lochia is small, the after-pains, if moderate, ought not to be restrained; because the squeezing which they occasion promotes the other evacuation, which is necessary for the recovery of the patient. After-pains may also proceed from an obstruction in some of the vessels, occasioning a small inflammation of the os internum and ligaments; and the squeezing thereby occasioned may not only help to propel the obstructing fluid, but also (if not too violent) contribute to the natural discharges.

Chap. IV. *Of the Lochia.*

We have already observed, that the delivery of the child and placenta is followed by an efflux of more or less blood, discharged from the uterus, which, by the immediate evacuation of the large vessels, is allowed to contract itself the more freely, without the danger of an inflammation, which would probably happen in the contraction, if the great vessels were not emptied at the same time: but as the fluids in the smaller vessels cannot be so soon evacuated, or returned into the vena cava, it is necessary that, after the great discharge is abated, a slow and gradual evacuation should continue, until the womb shall be contracted to near the same size to which it had before pregnancy; and to this it attains about the 18th or 20th day after delivery, though the period is different in different women.

When the large vessels are emptied immediately after delivery, the discharge frequently ceases for several hours, until the fluids in the smaller vessels are propelled into the larger, and then begins to flow again, of a paler colour.

Milk-fever.

The red colour of the lochia commonly continues till the fifth day, though it is always turning more and more serous from the beginning: but, about the fifth day, it flows of a clear, or sometimes (though seldom) of a greenish tint; for, the mouths of the vessels growing gradually narrower by the contraction of the uterus, at last allow the serous part only to pass: as for the greenish hue, it is supposed to proceed from a dissolution of the cellular or cribriform membrane or mucus, that surrounded the surface of the placenta and chorion; part of which, being left in the uterus, becomes livid, decays, and, dissolving, mixes with and tinctures the discharge as it passes along.

Though the lochia, as we have already observed, commonly continue till the 18th or 20th day, they are every day diminishing in quantity, and soonest cease in those women who suckle their children, or have had an extraordinary discharge at first; but the colour, quantity, and duration, differ in different women: in some patients, the red colour disappears on the first or second day; and in others, though rarely, it continues more or less to the end of the month: the evacuation in some is very small, in others excessive: in one woman it ceases very soon, in another flows during the whole month: yet all of these patients shall do well.

Some allege, that this discharge from the uterus is the same with that from a wound of a large surface; but it is more reasonable to suppose, that the change of colour and diminution of quantity proceed from the slow contraction of the vessels; because, previous to pus, there must have been lacerations and imposthumes, and, in women who have suddenly died after delivery, no wound or excoriation hath appeared upon the inner surface of the womb, which is sometimes found altogether smooth, and at other times rough and unequal, on that part to which the placenta adhered. The space that is occupied before the delivery, from being six inches in diameter, or 18 inches in circumference, will, soon after the birth, be contracted to one third or fourth of these dimensions.

Chap. V. *Of the Milk-fever.*

About the fourth day, the breasts generally begin to grow turgid and painful. We have formerly observed, that, during the time of uterine gestation, the breasts in most women gradually increase till the delivery, growing softer as they are enlarged by the vessels being more and more filled with fluids; and by this gradual distension they are prepared for secreting the milk from the blood after delivery. During the two or three first days after parturition, especially when the woman has undergone a large discharge, the breasts have been sometimes observed to subside and grow flaccid; and about the 3d or 4th day, when the lochia begin to decrease, the breasts swell again to their former size, and stretch more and more, until the milk, being secreted, is either sucked by the child, or frequently of itself runs out at the nipples.

Milk-fever. Moft of the complaints incident to women after delivery, proceed either from the obftruction of the lochia in the uterus, or of the milk in the breafts, occafioned by any thing that will produce a fever; fuch as catching cold, long and fevere labour, eating food that is hard of digeftion, and drinking fluids that quicken the circulation of the blood in the large veffels; by which means the fmaller, with all the fecretory and excretory ducts, are obftructed.

The difcharge of the lochia being fo different in women of different conftitutions, and befides in fome meafure depending upon the method of management, and the way of life peculiar to the patient, we are not to judge of her fituation from the colour, quantity, and duration of them, but from the other fymptoms that attend the difcharge; and if the woman feems hearty, and in a fair way of recovery, nothing ought to be done with a view to augment or diminifh the evacuation. If the difcharge be greater than fhe can bear, it will be attended with all the fymptoms of inanition; but as the lochia feldom flow fo violently as to deftroy the patient of a fudden, fhe may be fupported by a proper nourifhing diet, affifted with cordial and reftorative medicines. Let her, for example, ufe broths, jellies, and affes milk; if the pulfe is languid and funk, fhe may take repeated dofes of the *confect. cardiac.* with mixtures compofed of the cordial waters and volatile fpirits: fubaftringents and opiates frequently adminiftered, with the *cort. Peruvian.* in different forms, and auftere wines, are of great fervice. On the other hand, when the difcharge is too fmall, or hath ceafed altogether, the fymptoms are more dangerous, and require the contrary method of cure: for now the bufinefs is to remove a too great plenitude of the veffels in and about the uterus, occafioning tenfion, pain, and labour, in the circulating fluids; from whence proceed great heat in the part, reftlefsnefs, fever, a full, hard, quick pulfe, pains in the head and back, naufea, and difficulty in breathing. Thefe complaints, if not at firft prevented, or removed by reft and plentiful fweating, muft be treated with venefection and the antiphlogiftic method.

When the obftruction is recent, let the patient lie quiet, and encourage a plentiful diaphorefis, by drinking frequently of warm, weak, diluting fluids, fuch as water-gruel, barley-water, tea, or weak chicken-broth.

Should thefe methods be ufed without fuccefs, and the patient, far from being relieved by reft, plentiful fweating, or a fufficient difcharge of the obftructed lochia, labour under an hot dry fkin, anxiety, and a quick, hard, and full pulfe, the warm diaphoretics muft be laid afide; becaufe, if they fail of having the defired effect, they muft neceffarily increafe the fever and obftruction, and recourfe be had to bleeding at the arm or ankle to more or lefs quantity, according to the degree of fever and obftruction; and this evacuation muft be repeated as there is occafion. When the obftruction is not total, it is fuppofed more proper to bleed at the ankle than at the arm; and at this laft, when the difcharge is altogether ftopped, her ordinary drink ought to be impregnated with nitre.

If fhe is coftive, emollient and gently opening glyfters may be occafionally injected; and her breafts muft be fomented and fucked, either by the mouth or pipe-glaffes. If by thefe means the fever is abated, and the neceffary difcharges return, the patient commonly recovers; but if the complaints continue, the antiphlogiftic method muft ftill be purfued. If, notwithftanding thefe efforts, the fever is not diminifhed or removed by a plentiful difcharge of the lochia from the uterus, the milk from the breafts, or by a critical evacuation by fweat, urine, or ftool, and the woman is every now and then attacked with cold fhiverings; an abfcefs or abfceffes will probably be formed in the uterus or neighbouring parts, or in the breafts; and fometimes the matter will be tranflated to other fituations, and the feat of it foretold from the part's being affected with violent pains: thefe abfceffes are more or lefs dangerous according to the place in which they happen, the largenefs of the fuppuration, and the good or bad conftitution of the patient.

If, when the pains in the epigaftric region is violent, and the fever increafed to a very high degree, the patient fhould all of a fudden enjoy a ceffation from pain, without any previous difcharge or critical eruption, the phyfician may pronounce that a mortification is begun; efpecially if, at the fame time, the pulfe becomes low, quick, wavering, and intermitting: if the woman's countenance, from being florid, turns dufky and pale, while fhe herfelf, and all the attendants, conceive her much mended; in that cafe, fhe will grow delirious, and die in a very fhort time.

What we have faid on this fubject regards that fever which proceeds from the obftructed lochia, and in which the breafts may likewife be affected: but the milk-fever is that in which the breafts are originally concerned, and which may happen tho' the lochia continue to flow in fufficient quantity; neverthelefs, they mutually promote each other, and both are to be treated in the manner already explained; namely, by opiates, diluents, and diaphoretics, in the beginning; and, the prefcriptions failing, the obftructions muft be refolved by the antiphlogiftic method defcribed above. The milk-fever alone, when the uterus is not concerned, is not fo dangerous, and is much more eafily relieved. Women of an healthy conftitution, who fuckle their own children, have good nipples, and whofe milk comes freely, are feldom or never fubject to this diforder, which is more incident to thofe who do not give fuck, and neglect to prevent the fecretion in time; or, when the milk is fecreted, take no meafures for emptying their breafts. This fever likewife happens to women who try too foon to fuckle, and continue their efforts too long at one time; by which means the nipples, and confequently the breafts, are often inflamed, fwelled, and obftructed.

In order to prevent a too great turgency in the veffels of the breafts, and the fecretion of milk, in thofe women who do not choofe to fuckle, it will be proper to make external application of thofe things which, by their preffure and repercuffive force, will hinder the blood from flowing in too great a quantity to this part, which is now more yielding than at any other time: for this purpofe, let the breafts be covered with *emp. de minia*, *diapalma*, or *emp. fimp.* fpread upon linen, or cloths dipped in camphorated fpirits, be frequently applied to thefe parts and the arm-pits; while the patient's diet and drink is of the lighteft kind, and given

Evacuations.

given in small quantities. Notwithstanding these precautions, a turgency commonly begins about the third day; but by rest, moderate sweating, and the use of these applications, the tension and pain will subside about the fifth or sixth day, especially if the milk runs out at the nipples: but if the woman catches cold, or is of a full habit of body, and not very abstemious, the tension and pain increasing, will bring on a cold shivering succeeded by a fever; which may obstruct the other excretions, as well as those of the breast.

In this case, the sudorifics above recommended must be prescribed; and if a plentiful sweat ensue, the patient will be relieved; at the same time the milk must be extracted from her breasts, by sucking with the mouth or glasses: should these methods fail, and the fever increase, she ought to be blooded in the arm; and instead of the external applications hitherto used, emollient liniments and cataplasms must be substituted, in order to soften and relax. If, in spite of these endeavours, the fever proceeds for some days, the patient is frequently relieved by critical sweats, a large discharge from the uterus, miliary eruptions, or loose stools mixed with milk, which is curdled in the intestines; but should none of these evacuations happen, and the inflammation continue with increasing violence, there is danger of an imposthume, which is to be brought to maturity, and managed like other inflammatory tumors; and no astringents ought to be applied, lest they should produce scirrhous swellings in the glands.

As the crisis of this fever, as well as of that last described, often consists in miliary eruptions over the whole surface of the body, but particularly on the neck and breast, by which the fever is carried off, nothing ought to be given which will either greatly increase or diminish the circulating force, but such only as will keep out the eruptions. But if, notwithstanding these eruptions, the fever, instead of abating, is augmented, it will be necessary to diminish its force, and prevent its increase, by those evacuations we have mentioned above. On the contrary, should the pulse sink, the eruptions begin to retreat inwardly, and the morbific matter be in danger of falling upon the viscera, we must endeavour to keep them out by opiates and sudorific medicines; and here blisters may be applied with success.

Chap. VI. *Of the Evacuations necessary at the end of the Month after Delivery.*

Those who have had a sufficient discharge of the lochia, plenty of milk, and suckle their own children, commonly recover with ease, and, as the superfluous fluids of the body are drained off at the nipples, seldom require evacuations at the end of the month; but if there are any complaints from fulness, such as pains and stitches, after the 20th day, some blood ought to be taken from the arm, and the belly gently opened by frequent glysters, or repeated doses of laxative medicines.

If the patient has tolerably recovered, the milk having been at first sucked or discharged from the nipples, and afterwards discussed, no evacuations are necessary before the third or fourth week; and sometimes not till after the first flowing of the menses, which commonly happens about the fifth week; if they do not appear within that time, gentle evacuations must be prescribed, to carry off the plethora, and bring down the catamenia.

Explanation of the Plates.

EXPLANATION of the PLATES.

Plate CCCXVI. fig. 1. represents a well formed pelvis.

AAAA, The *ossa ilia*, properly so called. *a a*, The iliac fossæ. *b b b b*, The angle which divides transversely and obliquely, from behind forward, the internal face of the os ilium into two parts, making part of the brim of the pelvis. *c c c c*, The cristæ of the ossa ilia. *e e*, Their anterior superior spines. *f f*, The angle formed by the internal lip of the crista of the os ilium, to which is attached a ligament inserted at the other end in the transverse apophysis of the last lumbar vertebra. *g g*, The inferior angle of the os ilium, which makes part of the acetabulum.

BB, The os ischium. *h h*, Its tuberosities. *i i*, Its branches. *k k*, Its posterior part, making part of the acetabulum.

CC, The body of the os pubis. *l l*, Its angle. *m m*, Its posterior extremity, making part of the acetabulum. *n n*, Its descending branch, uniting with that of the ischium.

DDD, The os sacrum. 1, 2, 3, 4, The anterior holes. *o o o*, Its base. *p p*, The sides. *q*, The point. E, The coccyx. F, The last lumbar vertebra. *r r*, The transverse apophysis of that vertebra. *s s*, The ligament proceeding from the transverse apophysis of the last vertebra to the angle of the internal lip of the crista of the os ilium, marked *f f*. *t t*, Another ligament which descends from the same apophysis to the superior edge of the sacro-iliac symphysis.

GG, The femur or thigh-bone. VV, Its head received in the acetabulum. *u*, *u*, The foramina ovalia.

H, The symphysis of the ossa pubis. II, The sacro-iliac symphyses. K, The sacro-vertebral symphysis.

Fig. 2. represents the superior strait of a well formed pelvis.

a a, The iliac fossæ. *b*, The sacro-vertebral angle, or projection of the sacrum. *c*, The last lumbar vertebra. *d d*, The lateral parts of the base of the sacrum. *e e*, The sacro-iliac symphyses. *f f*, The parts over the acetabula. *g*, The symphysis of the pubes.

The lines denote the different diameters of the superior strait. AB, The little diameter. CD, The transverse or great diameter. EF, GH, The oblique diameter, extending from the left acetabulum to the right sacro-iliac junction.

Fig. 3. shows the inferior strait of a well formed pelvis.

a a, The external faces of the ossa ilia. *b b*, Their anterior superior spines. *c c*, Their anterior inferior spines. *d d*, The acetabula. *e e*, The foramina ovalia, with the obturator ligaments. *f f*, The ischiatic tuberosities. *g g*, The ossa pubis. *h h*, The branches of the os pubis and ischium united. *i i*, The sacrum. *k*, The coccyx. *l l*, The sacro-ischiatic ligaments. *m*, The symphysis of the pubes. *n*, Its arch.

The

MIDWIFERY. Plate CCCVI.

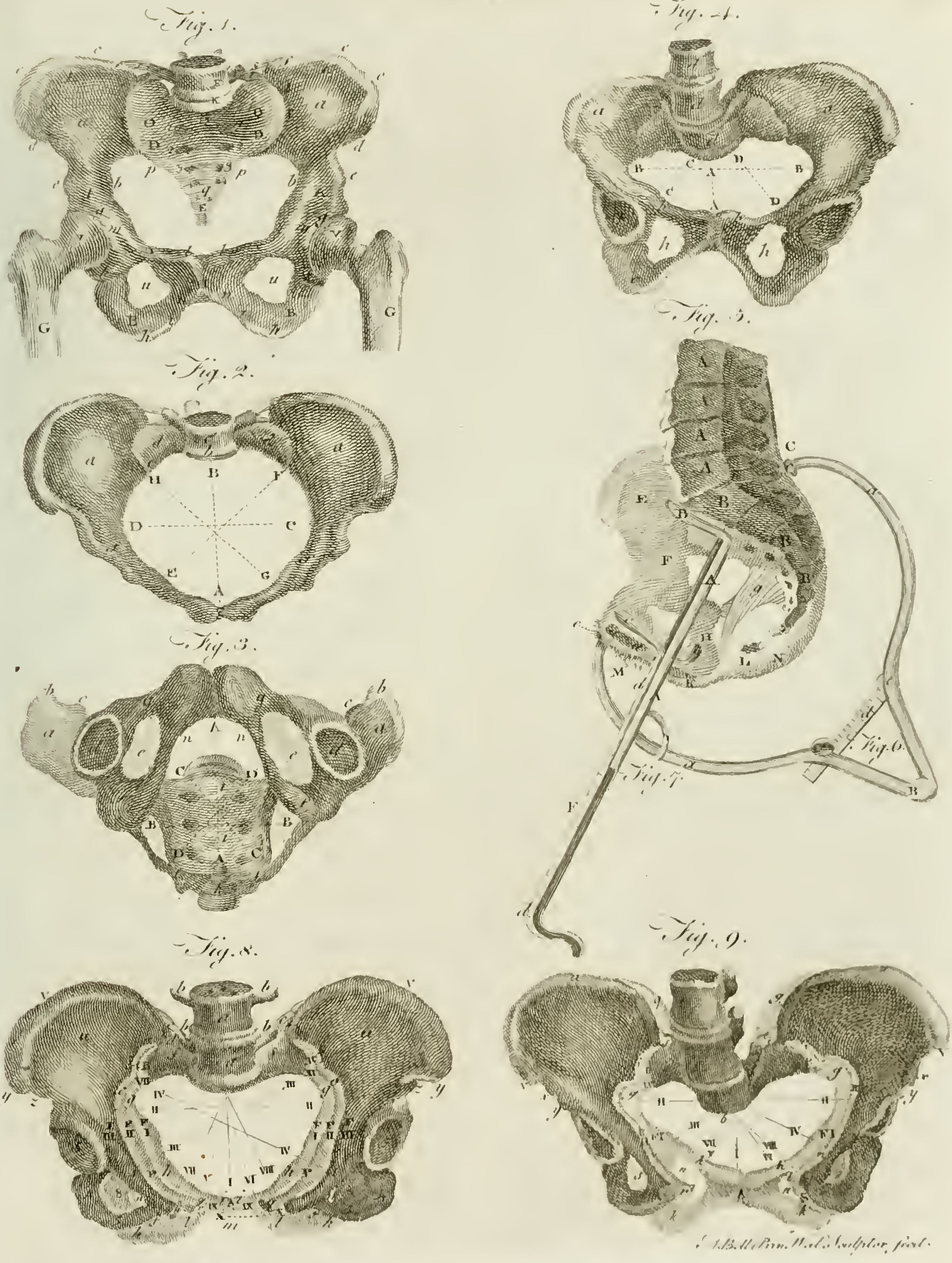


Fig. 10.

Fig. 11.

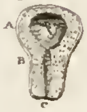


Fig. 13.

Fig. 12.

Fig. 14.

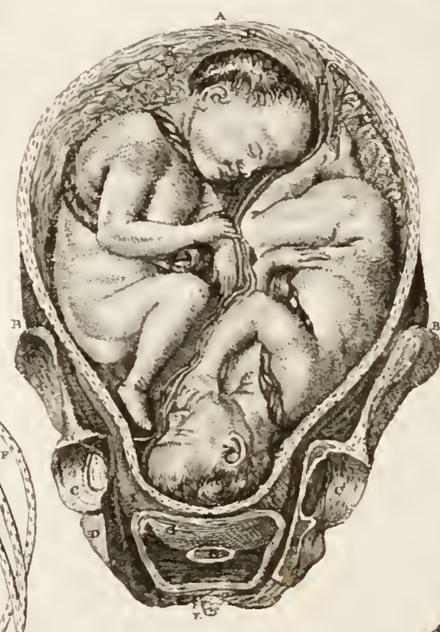


Fig. 15.

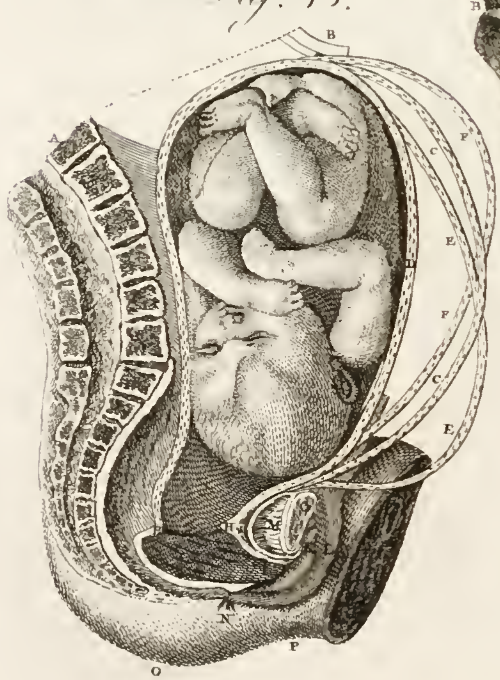


Fig. 16.

A. Bell Prin. Wal. Sculpt. f.

Explanation of the Plates.

The diameters of the inferior ftrait are marked by the lines. AA, The *antero-pofterior*, or great diameter. BB, The tranfverfe or little diameter. CC, DD, The oblique diameters.

Fig. 4. fhows a deformed pelvis.

aa, The offa ilia. *bb*, The offa pubis. *cc*, The offa ifchia. *ddd*, The laft lumbar vertebræ. *e*, The projection of the facrum. *ff*, The facro-iliac fymphyfes. *g*, The fymphyfis of the pubes. *hh*, The foramina ovalia. *ii*, The branches of the offa pubis and ifchia, which form the anterior [illegible] of the pelvis. *kk*, The acetabula.

AA, The *antero-pofterior* diameter; the natural length being 14 or 15 lines. BB, The tranfverfe diameter; the natural length four inches and ten lines. CC, The diftance from the projection of the facrum to that point of the margin which anfwers to the left acetabulum, being 13 lines. DD, The diftance from the fame point of the facrum to that of the margin which anfwers to the right acetabulum, 20 lines.

Fig. 5. fhows a vertical fection of the pelvis.

A, A, A, A, The four laft lumbar vertebræ. B, B, B, The os facrum. CC, The coccyx. *dd*, The furface refulting from the fection of the fymphyfis of the pubes. E, The left iliac foffa. F, The left fide of the fuperior ftrait. G, The facro-ifchiatic ligament. H, The tuberofity of the ifchium.

ii, The entrance of the vagina. K, one of the labia pudendi. L, The anus. M, The mons veneris. N, The left natis.

Plate CCCVII.

Fig. 10. gives a front-view of the uterus *in fitu*, fufpended in the vagina; the anterior parts of the offa ifchium, with the offa pubis, pudenda, perinæum, and anus, being removed, in order to fhow the internal parts.

A, the laft vertebra of the loins. BB, the offa ilium. CC, the acetabula. DD, the inferior and pofterior parts of the offa ifchium. E, the part covering the extremity of the coccyx. F, the inferior part of the rectum. GG, the vagina cut open longitudinally, and ftretched on each fide of the collum uteri, to fhow in what manner the uterus is fufpended in the fame.

HH, part of the vefica urinaria ftretched on each fide of the vagina, and inferior part of the fundus uteri.

I, the collum uteri. K, the fundus uteri. LL, the tubi Fallopiani and fimbriæ. MM, the ovaria. NN, the ligamenta lata and rotunda. OO, the fuperior part of the rectum.

Fig. 11. gives a front view of the uterus in the beginning of the firft month of pregnancy; the anterior part being removed that the embryo might appear through the amnios, the chorion being diffected off.

A, the fundus uteri. B, the collum uteri, with a view of the rugous canal that leads to the cavity of the fundus. C, the os uteri.

Fig. 12. In the fame view and fection of the parts as in fig. 10. fhows the uterus as it appears in the fecond or third month of pregnancy.

F, the anus. G, the vagina, with its plicæ.

HH, the pofterior and inferior part of the urinary bladder extended on each fide; the anterior and fuperior part being removed.

II, the mouth and neck of the womb, as raifed up when examining the fame by the touch, with one of the fingers in the vagina.

KK, the uterus as ftretched in the fecond or third month, containing the embryo, with the placenta adhering to the fundus.

Fig. 13. In the fame view and fection of the parts with the former figures, reprefents the uterus in the eighth or ninth month of pregnancy.

A, the uterus as ftretched to near its full extent, with the waters, and containing the fœtus entangled in the funis, the head prefenting at the upper part of the pelvis.

BB, the fuperior part of the offa ilium. CC, the acetabula. DD, the remaining pofterior parts of the offa ifchium. E, the coccyx. F, the inferior part of the rectum. GGG, the vagina ftretched on each fide. H, the os uteri, the neck being ftretched to its full extent or entirely obliterated. II, part of the vefica urinaria. KK, the placenta, at the fuperior and pofterior part of the uterus. LL, the membranes. M, the funis umbilicalis.

Fig. 14. gives a front view of twins *in utero* in the beginning of labour.

A, the uterus as ftretched, with the membranes and waters. BB, the fuperior parts of the offa ilium. CC, the acetabula. DD, the offa ifchium. E, the coccyx. F, the lower part of the rectum. GG, the vagina.

H, the os internum ftretched open about a fingerbreadth, with the membranes and waters, in time of labour pains.

II, the inferior part of the uterus, ftretched with the waters which are below the head of the child that prefents.

KK, the two placentas adhering to the pofterior part of the uterus, the two fœtufes lying before them, one with its head in a proper pofition at the inferior part of the uterus, and the other fituated preternaturally with the head to the fundus; the bodies of each are here entangled in their proper funis, which frequently happens in the natural as well as preternatural pofitions.

LLL, the membranes belonging to each placenta.

Fig. 15. fhows, in a lateral view and longitudinal divifion of the parts, the gravid uterus when labour is fomewhat advanced.

A, the loweft vertebra of the back; the diftance from which to the laft mentioned vertebra is here fhown by dotted lines. CC, the ufual thicknefs and figure of the uterus when extended by the waters at the latter end of pregnancy. D, the fame contracted and grown thicker after the waters are evacuated. EE, the figure of the uterus when pendulous. FF, the figure of the uterus when ftretched higher than ufual, which generally occafions vomitings and difficulty of breathing. G, the os pubis of the left fide. HH, the os internum. I, the vagina. K, the left nympha. L, the labium pudendi of the fame fide. M, the remaining portion of the bladder. N, the anus. OP, the left hip and thigh.

Fig. 16. fhows the forehead of the fœtus turned backwards to the os facrum, and the occiput below the pubes, by which means the narrow part of the head is to the narrow part of the pelvis, that is, between the inferior parts of the offa ifchium.

Explanation of the Plates.

A, the uterus contracted closely to the fœtus after the waters are evacuated. BCD, the vertebræ of the loins, os sacrum, and coccyx. E, the anus. F, the left hip. G, the perinæum. H, the os externum beginning to dilate. I, the os pubis of the left side. K, the remaining portion of the bladder. L, the posterior part of the os uteri.

Plate CCCVIIII. Fig. 17. is principally intended to show in what manner the perinæum and external parts are stretched by the head of the fœtus, in a first pregnancy, towards the end of the labour.

A, the abdomen. B, the labia pudendi. C, the clitoris and its preputium. D, the hairy scalp of the fœtus, swelled at the vertex, in a laborious case, and protruded to the os externum. E, F, the perinæum and anus pushed out by the head of the fœtus in form of a large tumor. GG, the parts that cover the tuberosities of the ossa ischium. H, the part that covers the os coccygis.

Fig. 18. shows in what manner the head of the fœtus is helped along with the forceps, as artificial hands, when it is necessary for the safety of either mother or child.

AABC, the vertebræ of the loins, os sacrum, and coccyx. D, the os pubis of the left side. E, the remaining part of the bladder. FF, the intestinum rectum. GGG, the uterus. H, the mons veneris. I, the clitoris, with the left nymph. X, the corpus cavernosum clitoridis. V, the meatus urinarius. K, the left labium pudendi. L, the anus. N, the perinæum. QP, the left hip and thigh. R, the skin and muscular parts of the loins.

Fig. 19. shows the head of the fœtus, by strong labour-pains, squeezed into a longish form, with a tumor on the vertex, from a long compression of the head in the pelvis.

K, the tumor on the vertex. L, the forceps. M, the vesica urinaria much distended with a large quantity of urine from the long pressure of the head against the urethra. N, the under part of the uterus. OO, the os uteri.

Fig. 20. shows, in the lateral view, the face of the child presenting and forced down into the lower part of the pelvis, the chin being below the pubes, and the vertex in the concavity of the os sacrum: the water being likewise all discharged, the uterus appear closely joined to the body of the child.

Fig. 21. shows, in a lateral view, the head of the child in the same position as in the former figure.

AB, the vertebræ of the loins, os sacrum, and coccyx. C, the os pubis of the left side. D, the inferior part of the rectum. E, the perinæum. F, the left labium pudendi. GGG, the uterus.

Fig. 22. gives a lateral internal view of a distorted pelvis, divided longitudinally, with the head of a fœtus of the seventh month passing the same.

ABC, the os sacrum and coccyx. D, the os pubis of the left side. E, the tuberosity of the os ischium of the same side.

Fig. 23. gives a side view of a distorted pelvis, divided longitudinally, with the head of a full grown fœtus squeezed into the brim, the parietal bones decussating each other, and compressed into a conical form.

ABC, the os sacrum and coccyx. D, the os pubis of the left side. E, the tuberosity of the os ischium. F, the processus acutus. G, the foramen magnum.

Explanation of the Plates.

Plate CCCIX. Fig. 24. shows, in a front view of the pelvis, the breech of the fœtus presenting, and dilating the os internum, the membranes being too soon broke.

Fig. 25. is the reverse of the former, the fore-parts of the child being to the fore part of the uterus.

Fig. 26. represents, in a front view of the pelvis, the fœtus compressed, by the contraction of the uterus, into a round form, the fore-parts of the former being towards the inferior part of the latter, and one foot and hand fallen down into the vagina. In this figure, the anterior part of the pelvis is removed, by a longitudinal section through the middle of the foramen magnum.

AA, the superior parts of the ossa ilium. BB, the uterus. C, the mouth of the womb stretched and appearing in OOOO, the vagina. D, the inferior and posterior part of the os externum. EEEE, the remaining part of the ossa pubis and ischium. FFFF, the membrana adiposa.

Fig. 26. represents, in the same view with fig. 27. the fœtus in the contrary position; the breech and fore-parts being towards the fundus uteri, the left arm in the vagina, and the fore-arm without the os externum, the shoulder being likewise forced into the os uteri.

Plate CCCVI. fig. 8. shows a deformed pelvis of which the small diameter of the superior strait is only 2 inches seven lines. The figure is triple: F. I. shows it in its natural state; F. II. the ossa pubis separated 18 lines; and F. III. with a separation of two inches and an half, in order to show the quantiy of amplification which the section of the symphysis in such a pelvis can produce.

F. I. *a a*, the two last lumbar vertebræ; *bbbb*, the transverse apophyses of these vertebræ; *cc*, ligaments proceeding from the transverse apophyses of the last of these vertebræ to the middle and posterior part of the internal lip of the crista of the os ilium; *dd*, other ligaments descending from the same apophyses to the superior part of the sacro-iliac symphyses; *e*, the projection of the sacrum; *ff*, the lateral parts of the base of the sacrum; *gg*, part of the ossa ilia: the rest of those bones being concealed by F. II. and III.

hh, The bodies of the ossa pubis; *ii*, their angles.

kk, The ossa ischia; *ll*, the branches of these bones, and of the pubes.

m, The arch of the ossa pubis at the fore part of the pelvis.

nn, The foramina ovalia concealed by the ossa pubis of F. II. and III.

A, The symphysis of the ossa pubis seen perspectively. B B, the sacro-iliac symphyses.

F. II. *oo*, Part of the ossa ilia.

PP, The bodies of the ossa pubis; *qq*, their angles; *rr*, their articular facettes seen perspectively; *ff*, very small portions of the branches of the ossa pubis.

ss, The ossa ischia appearing behind the foramina ovalia of nº III; *tt*, articular facettes of the ossa ilia, corresponding to similar ones observed at the sides of the sacrum.

F. III. *uu*, The ossa ilia; *vv*, their cristæ; *xx*, the angle formed by the internal lip of the crista in the middle and posterior part of its length; *yy*, the anterior and superior

Fig. 17.

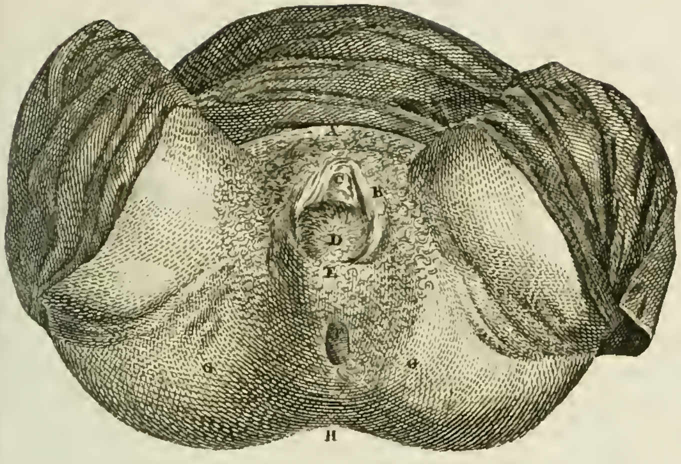


Fig. 18.

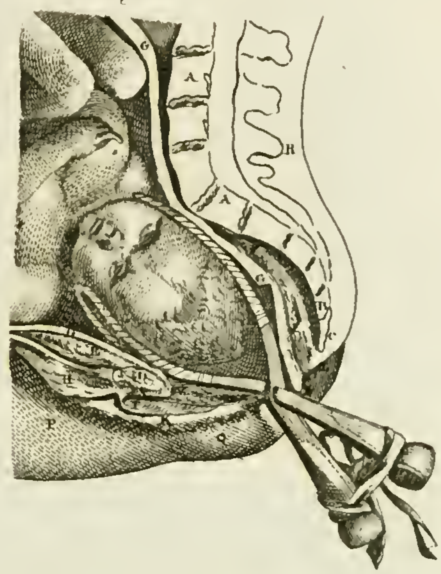


Fig. 19.

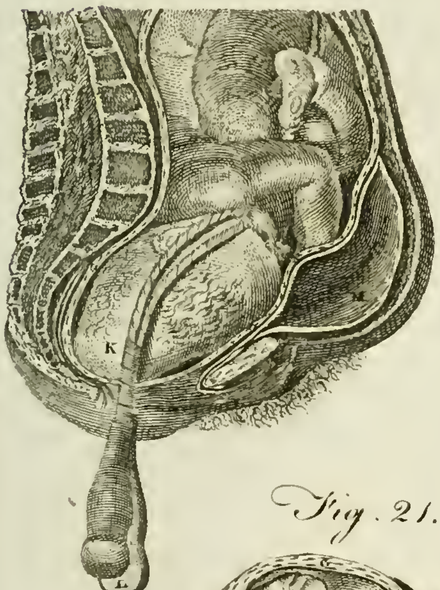


Fig. 20.

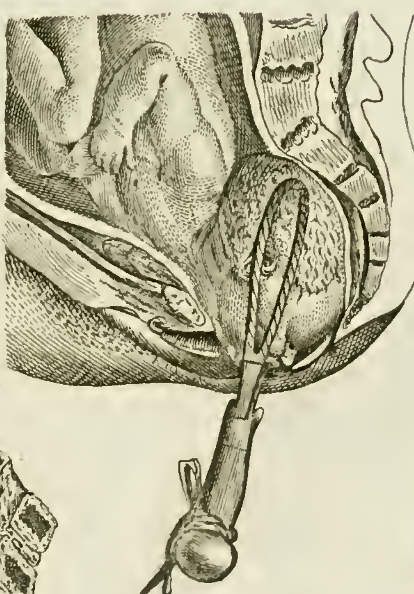


Fig. 22.

Fig. 21.

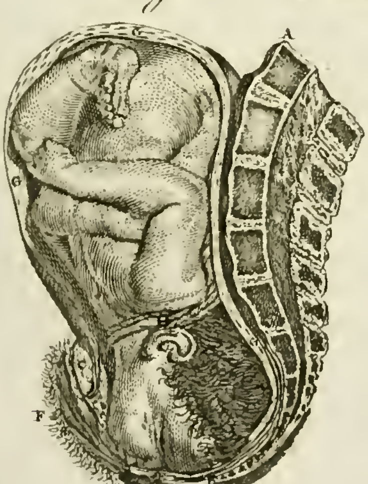


Fig. 23.

A.Bell Prin. Wal. Sculptor fecit

Explanation of the Plates.

superior spines of the ossa ilia; *z z*, the anterior spines of these bones; & &, articular facettes of the ossa ilia, making part of the sacro-iliac symphyses.

1 1, The ossa pubis; 2 2, their angles; 3 3, their articular facettes seen perspectively.

4 4, The ossa ischia; 5 5, the united branches of the ossa ischia and pubis; 6 6, the acetabula.

The lines indicate the natural size of the pelvis in the different directions in which they are traced; and their dotted extremities, the amplification which the superior strait acquires in those same directions at a separation of eighteen lines, and of thirty lines between the ossa pubis. Line I. Antero-posterior diameter of the superior strait, or the distance from the pubes to the projection of the sacrum; two inches seven lines. Line II. Transverse diameter of the superior strait, in its most extensive part; four inches seven lines. Line III. Oblique diameter of the superior strait, which extends from that point of the strait which corresponds with the anterior edge of the left acetabulum, to the right sacro-iliac junction; three inches eleven lines. Line IV. The other oblique diameter, which extends from that point of the strait which answers to the anterior edge of the right acetabulum, to the left sacro-iliac symphysis; four inches.

By giving the smallest attention to the relation of these dimensions to those which the head of a fœtus of the usual size presents in their direction in time of labour, we shall see that they are very favourable; except the first, which is, strictly speaking, eleven lines too short, being only thirty-one lines in extent: whereas the transverse diameter of the head is commonly forty-two. It is only in this latter direction, and to the extent of eleven lines, that it would be necessary to augment the capacity of such a pelvis, to favour delivery. As the greater part of those who have performed this new operation, have only obtained a separation of eighteen lines or thereabouts between the ossa pubis, it is fixed at that degree in the second figure.

By such a separation in a pelvis perfectly similar to that here represented, the angle of each os pubis recedes from the centre of the projection of the sacrum three lines or very near beyond their natural distance from it. (See the lines V. and VI). The antero-posterior diameter receives but the same increase, if we consider it as lengthened to the middle of the dotted line IX. IX. which marks the depth at which it may be presumed the lateral convexity of the head engages. Both the oblique diameters augment five lines before, and about two lines and an half backward; and the transverse diameter seven lines or very nearly.

It is evident, that a separation of eighteen lines on such a pelvis cannot remove the disproportion which exists between the small diameter of the superior strait and the small diameter of the child's head; since the former augments only three lines, considered in the most favourable point of view. The amplification which the other diameters receive from a similar separation, is absolutely useless; those diameters being naturally large enough.

Supposing that the ossa pubis recede in an equal degree, in separating two inches and an half, the angle of each of them will remove from the centre of the projection of the sacrum, only six lines farther than the distance they were from it before; which also gives an increase of but six lines between these two points. (See the lines VII. and VIII). The small diameter of the entrance of the pelvis does not gain much more, considering it to the middle of the dotted line XX. which marks the bounds beyond which the convexity of the head could not engage between the ossa pubis, even if the pelvis were divested of all its soft parts: which does not happen in the section of the pubes, for the neck of the bladder, the canal of the urethra, their cellular tissue, the anterior semicircle of the orifice of the uterus, and the anterior part of the vagina present at the opening and before the child's head. At this degree of separation, the transverse diameter augments about thirteen lines, and each oblique diameter nearly fourteen lines: a superfluous increase, since those diameters, in the pelvis represented, have all the length requisite for delivery.

The posterior extremities of the oblique diameters, which are dotted and marked with the figures XI and XII, show the separation which is to be feared in the sacro-iliac symphyses, by separating the ossa pubis two inches and an half. It was at that degree that Mr Baudelocque observed they were open in most of his experiments; since he could easily put the end of his finger, and even of his thumb, into them.

Admitting that the convexity of one of the sides of the child's head may let itself in between the ossa pubis separated to two inches and an half, as far as the dotted line X X, traced on that very convexity, it is evident that that separation cannot procure the relation of dimensions necessary for an easy delivery, when the pelvis has originally but two inches six or seven lines in the small diameter: whence it follows that the section of the pubes, supposing that we could obtain a separation of two inches and an half in the living woman without exposing her to disagreeable accidents, would not answer in the case of a pelvis similar to that represented in this plate.

Fig. 9. shows a pelvis with only 14 or 15 lines in the small diameter of its entrance, and four inches ten lines in the largest. The figure is triple like the former. F. I. represents it in its natural situation; F. II. with the ossa pubis separated two inches and a half; and F. III. with a separation of three inches. M. le Roy says, that he constantly obtained these two degrees of separation without any inconvenience.

F. I. *aaa*, The three last lumbar vertebræ. *b*, The projection formed by the last of those vertebræ, with the base of the sacrum. *cc*, The sides of the base of the sacrum. *ddd*, The transverse apophyses of the right side of the above-mentioned vertebræ. *ee*, A ligament extending from the first of those apophyses to the angle made by the internal lip of the crista of the os ilium towards its middle and posterior part. *ff*, Another ligament which depends from that apophysis to the superior part of the sacro-iliac symphysis. *gggg*, Part of the os ilium. *hh*, The bodies of the ossa pubis: *ii*, their angles. *kk*, The ossa ischia. *ll*, The branches of the ossa ischia and pubis. *m*, The arch of the ossa pubis. *nn*, The foramina ovalia. A, the symphysis of the ossa pubis. BB, The sacro iliac symphyses.

F. II.

Explanation of the Plates.

F. II. *o o o o*, Part of the offa ilia. *f f*, The articular facettes of the offa ilia, making part of the facro-iliac fymphyfes. *p p*, The bodies ofthe offa pubis. *q q*, The angles of the offa pubis feparated two inches and an half. *r r*, The cartilaginous facettes of the offa pubis feen perfpectively. *s s*, The branches of the offa ifchia and pubes.

F. III. *t t*, The offa ilia: *u u*, their criftæ: *v v*, their anterior fuperior fpines: *x x*, their anterior inferior fpines.

y y, The anterior inferior fpines of the offa ilia of F. II. *z z*, Their anterior articular facettes, making part of the facro iliac fymphyfis.

& &, The bodies of the offa pubis: 1 1, their angles. 2 2, The articular facette of each os pubis feen perfpectively. 3 3, The united branches of the offa pubis, and ifchia feen perfpectively.

4 4, The offa ifchia. 5 5, The foramina ovalia, behind which is feen part of the offa ifchia of F. II. 6 6, The acetabula.

The lines indicate the length of the different diameters of the fuperior ftrait, in the direction in which they are traced; and their dotted extremities, the amplification to be expected from a feparation of two inches and an half, and of three inches.

Line I, The antero-pofterior, or fmall diameter of the fuperior ftrait; one inch two or three lines. Line II, The tranfverfe diameter of the fame ftrait: this line, which is four inches ten lines in extent, paffes under the projection of the facrum. Line III, The diftance from the middle and left lateral part of the projection of the facrum, to that point of the margin of the pelvis which anfwers to the anterior edge of the acetabulum on the fame fide; one inch. Line IV, The diftance from the middle and right lateral part of the projection of the facrum, to that point of the margin which anfwers to the anterior edge of the acetabulum on the fame fide; one inch eight lines.

The relation of thefe dimenfions to thofe of a child's head of the ufual fize, is fuch, that the fmall diameter of the latter, fuppofed always to be three inches and an half, furpaffes the fmall diameter of the entrance of fuch a pelvis by 27 or 28 lines. This pelvis would be large enough in the direction of the line II, II.

By feparating the offa pubis two inches and an half, we augment the breadth of the entrance of the pelvis about three quarters of an inch in the direction of the line II, II: as much, or nearly in the direction of the line III, and only fix lines in that of the line IV. The angle of each os pubis marked by the letter *q*, recedes from the centre of the projection of the facrum, nine or ten lines beyond what it was diftant from it before the feparation of the bones: the entrance of the pelvis increafes as much in the direction of the line V, and only half an inch in the courfe of the line VI. The fmall diameter, or the line I, continued to the middle of the dotted line IX, IX, which fhows the depth to which the child's head may be let in between the offa pubis feparated two inches and an half, if the pelvis were divefted of all its foft parts: this diameter will then be augmented only feven lines; whence we fee that it would ftill be an inch and an half, at leaft, fhorter than the fmall diameter of the head of a child of the ufual fize.

The fection of the pubes would therefore be fruitlefs on fuch a pelvis, if it could only procure a feparation of two inches and an half; which feems a very exorbitant one. With more reafon would it be unfuccefsful, if we could feparate the offa pubis only 18 lines, as has moft frequently happened; fince it could not procure the proportion neceffary for delivery, even if we could turn that feparation entirely to the advantage of the fmall diameter of the fuperior ftrait.

Let us fee if a feparation of three inches could procure that proportion.

By feparating the offa pubis three inches, we augment the breadth of the pelvis 12 or 13 lines in the direction of the line II, II; 10 lines at moft in the courfe of the line III; only feven in the line IV; about an inch in the line V; and only feven lines in the direction of the line VI: the angle of each os pubis recedes an inch farther from the projection of the facrum, than the diftance it was at before the feparation of the bones; which augments the opening of the pelvis to the amount of an inch or thereabouts in the direction of the line VII, and only half an inch in the line VIII. The antero-pofterior diameter of the entrance of this pelvis, confidered as far as the middle of the dotted line X, X, which fhows the greateft depth to which the child's head could be let in between the offa pubis feparated three inches, if the pelvis were divefted of the foft parts, increafes but 10 lines or thereabouts; which cannot remove the difproportion that exifted before the fection of the pubes, between that diameter and the thicknefs of the child's head which muft pafs in that direction. From whence we ought to conclude that this feparation alfo would have no fuccefs, if the pelvis were as much deformed as that defigned.

The dotted lines XI and XII, fhow the feparation to be feared in the facro-iliac fymphyfes, by feparating the offa pubis three inches.

The two other dotted lines, marked by the characters IX, IX, and X, X, fhow how far the child's head may be let in between the offa pubis feparated to the two degrees ftated: they were traced on the convexity of a real head applied behind the offa pubis in a pelvis ftripped of its foft parts.

Plate CCCX. fig. 29. fhows a well formed pelvis, the anterior part of which is taken away, to fhow one of the tranfverfe pofitions of the face of the child, and explain more fully the mechanifm of that kind of labour.

a, a, Part of the iliac foffæ. *b, b*, Part of the criftæ of the offa ilia. *c, c*, Their anterior fuperior fpines.

d, d, The ifchiatic tuberofities. *e, e*, The acetabula. *f, f*, The thicknefs of the offa ifchia fawn through vertically before their tuberofities.

g, g, The bodies of the offa pubis fawn through before the acetabula.

h, h, h, A circle reprefenting a vertical fection of the uterus, the anterior part of which is taken away, in order to fhow the child. *i*, The child's chin. *k*, The pofterior extremity of the head. *l, l, l*, The lever applied along the crown of the head, the extremity of it extending beyond the pofterior fontanella.

Explanation of the Plates.

m, The left lateral, and inferior part of the pelvis. *n*, A portion of the right lateral part of the uterine cavity. *o*, The left hand. *p*, *q*, The fore and middle fingers, placed at the fides of the nofe, and prefling againft the upper jaw. R, The right hand grafping the extremity of the lever.

Plate CCCX.

Fig. 30. fhows the fame vertical fection of a pelvis as the laft; with the child's body entirely difengaged from it. The head grafped by the forceps is retained at the fuperior ftrait, with the occiput over the pubes, and the lower part of the fore-head againft the projection of the facrum.

a, *a*, The laft lumbar vertebræ. *d*, *d*, The canal of thefe vertebræ, and of the facrum. *g*, *g*, *g*, *g*, Spiny tubercles of the vertebræ above mentioned. *b*, *b*, *b*. *b*, The falfe vertebræ of the facrum. *c*, *c*, *c*, The coccyx. *e*, *e*, The flatted portion of the anterior face of the facrum.

f, The left facro-ifchiatic ligament. *h*, The cartilaginous and ligamentous facette of the left os pubis, making part of the fymphyfis.

i, The mons veneris. *k*, *k*, *k*, *k*, A circle reprefenting the fection of the uterus, the right fide of which is taken away to fhow the head and the inftrument. *l*, *l*, A portion of the placenta attached to the fuperior and anterior part of the uterus.

m, *m*, *m*, The female branch of the forceps applied on the left fide of the head, which anfwers to the right fide of the pelvis. *n*, *n*, The male branch of the forceps, applied at the left fide of the pelvis, and the right fide of the head. *o*, Part of the left fmall facro-ifchiatic ligament. P, Part of the left os ilium, the reft being concealed by the head.

q, The point to which we ought to bring the lower extremity of the forceps, in bringing the head down into the cavity of the pelvis.

R, The point of elevation at which the extremity of the forceps muft be held, when the head occupies the bottom of the pelvis, after having replaced the face underneath.

Fig. 31. fhows alfo the vertical fection of a pelvis; but it is fuppofed to have only three inches fix lines in the fmall diameter of its entrance. The bafe of the cranium is engaged in it in a tranfverfe direction, the occiput being turned towards the left fide, and the face to the right fide; fo that the greateft thicknefs of the head is ftill above the ftrait.

a, *a*, The two laft lumbar vertebræ. *b*, *b*, *b*, *b*, *b*, The five falfe vertebræ of the facrum. *c*, *c*, *c*, The three pieces of the coccyx. *d*, *d*, The canal of the aforefaid vertebræ. *e*, *e*, *e*, *e*, Their fpinous apophyfes. *f*, *f*, Part of the anterior face of the facrum.

g, The left facro-ifchiatic ligament. *h*, The cartilaginous and ligamentous facette of the left os pubis, making part of the fymphyfis. *i*, The mons veneris.

k, *k*, *k*, *k*, A circle indicating the fection of the uterus in the fame direction as that of the pelvis. *l*, *l*, A portion of the placenta attached to the fundus of the uterus.

m, *m*, *m*, The female branch of the forceps, applied on the left fide of the child's head, and under the fymphyfis of the pubes. *n*, *n*, *n*, The female branch of the forceps applied on the right fide of the head, and before the facrum. *o*, A dotted line, in the direction of which the inftrument muft be pulled to bring down the head hea! into the pelvis. *p*, The point of elevation at which the forceps muft be held when the head is brought down to the bottom of the pelvis, after having turned the face into the curve of the os facrum.

Explanation of the Plates.

Plate CCCVI. fig. 6. fhows M. Baudelocque's calipers for meafuring the antero-pofterior diameter of the fuperior ftrait.

a, *a*, The branches of the calipers. B, The hinge which unites the two branches. *c*, *c*, Lenticular buttons which terminate the branches. *d*, A graduated fcale nine inches long, intended to demonftrate the thicknefs of the body comprifed between the two branches. This fcale is contained in a deep groove cut lengthwife in the branch of the calipers, from the letter *e* to the hinge B; and paffes through a mortoife made in the other branch under the letter *f*. *e*, The place where the fcale is united by a kind of hinge. *f*, A little fcrew with a flat head, defigned to fix the fcale, while we calculate the thicknefs of the body comprifed between the two branches.

Fig. 7. fhows the pelvimeter of M. Coutonli developed in the pelvis.

A, A, The firft branch; whofe fquare, B, is applied to the projection of the facrum. C, *c*, A kind of hooks intended to keep the firft branch in its place, while we introduce and develope the fecond. This has a dove-tailed groove, in which the body of the fecond branch is lodged and moved. *d*, *d*, the fecond branch of the inftrument, whofe fquare *e* is placed againft the fymphyfis of the pubes. F, a fcale four inches long, graduated in the branch *d*, *d*; and intended to fhow the degree of opening from the pubes to the facrum.

Plate CCCVIII. fig. 21. reprefents, in a lateral view of the pelvis, the method of extracting, by means of a curved crotchet, the head of the fœtus, when left in the uterus, after the body is delivered and feparated from it; either by its being too large, or the pelvis too narrow.

ABC, the os facrum and coccyx.

D, the os pubis of the left fide.

EE, the uterus.

F, the locking part of the crotchet.

g, *h*, *i*, The point of the crotchet on the infide of the cranium.

Plate CCCIX.

Fig. 32. reprefents the forceps and blunt hook.

A, the ftraight forceps, in the exact proportion as to the width between the blades, and length from the points to the locking part; the firft being two and the fecond fix inches, which, with three inches and a half (the length of the handles), make in all 11 inches and a half.

B reprefents the pofterior part of a fingle blade, in order to fhow the width and length of the open part of the fame, and the form and dimenfions of the whole.

C, the blunt hook, which is ufed for three purpofes: 1. To affift the extraction of the head, after the cranium is opened with the fciffars, by introducing the fmall end along the ear on the outfide of the head to above the under-jaw, where the point is to be fixed; the other extremity of the hook being held with one hand, whilft two fingers of the other are to be introduced into the forefaid opening, by which hold the head is to be gradually extracted. 2. The fmall end

is

Explanation of the Plates.

is ufeful in abortion, in any of the firft four or five months, to hook down the fecundines, when lying loofe in the uterus, when they cannot be extracted by the fingers or labour-pains, and when the patient is much weakened by floodings. 3. The large hook at the other end is ufeful to affift the extraction of the body, when the breech prefents; but fhould be ufed with great caution, to avoid the diflocation or fracture of the thigh.

Fig. 33. A reprefents the whale-bone fillet, which may be fometimes ufeful in laborious cafes, when the operator is not provided with the forceps, in fudden and unexpected exigencies.

BB, two views of a peffary for the prolapfus uteri. After the uterus is reduced, the large end of the peffary is to be introduced into the vagina, and the os uteri retained in the concave part, where there are three holes to prevent the ftagnation of any moifture. The fmall end without the os externum has two tapes drawn through the two holes, which are tied to four other tapes, that hang down from a belt that furrounds the woman's body, and by this means keep up the peffary. This peffary may be taken out by the patient when fhe goes to bed, and introduced again in the morning; but as this fometimes rubs the os externum, fo as to make its ufe uneafy, the round kind, marked C, are of more general ufe. They are made of wood, ivory, or cork, (the laft covered with cloth and dipped in wax): the peffary is to be lubricated with pomatum, the edge forced through the paffage into the vagina, and a finger introduced in the hole in the middle lays it acrofs within the os externum. They ought to be larger or fmaller, according to the widenefs or narrownefs of the paffage, to prevent their being forced out by any extraordinary ftraining.

DD gives two views of a female catheter, to fhow its degree of curvature and different parts.

Fig. 34. *a*, reprefents a pair of curved crotchets locked together in the fame manner as the forceps. The dotted lines along the infide of one of the blades reprefent a fheath contrived to guard the point till it is introduced high enough: the ligature at the handles marked with two dotted lines is then to be untied, the fheath withdrawn, and the point being uncovered is fixed as in fig. 21. (Pl. cccviii.)

b, Gives a view of the back-part of one of the crotchets, which is 12 inches long.

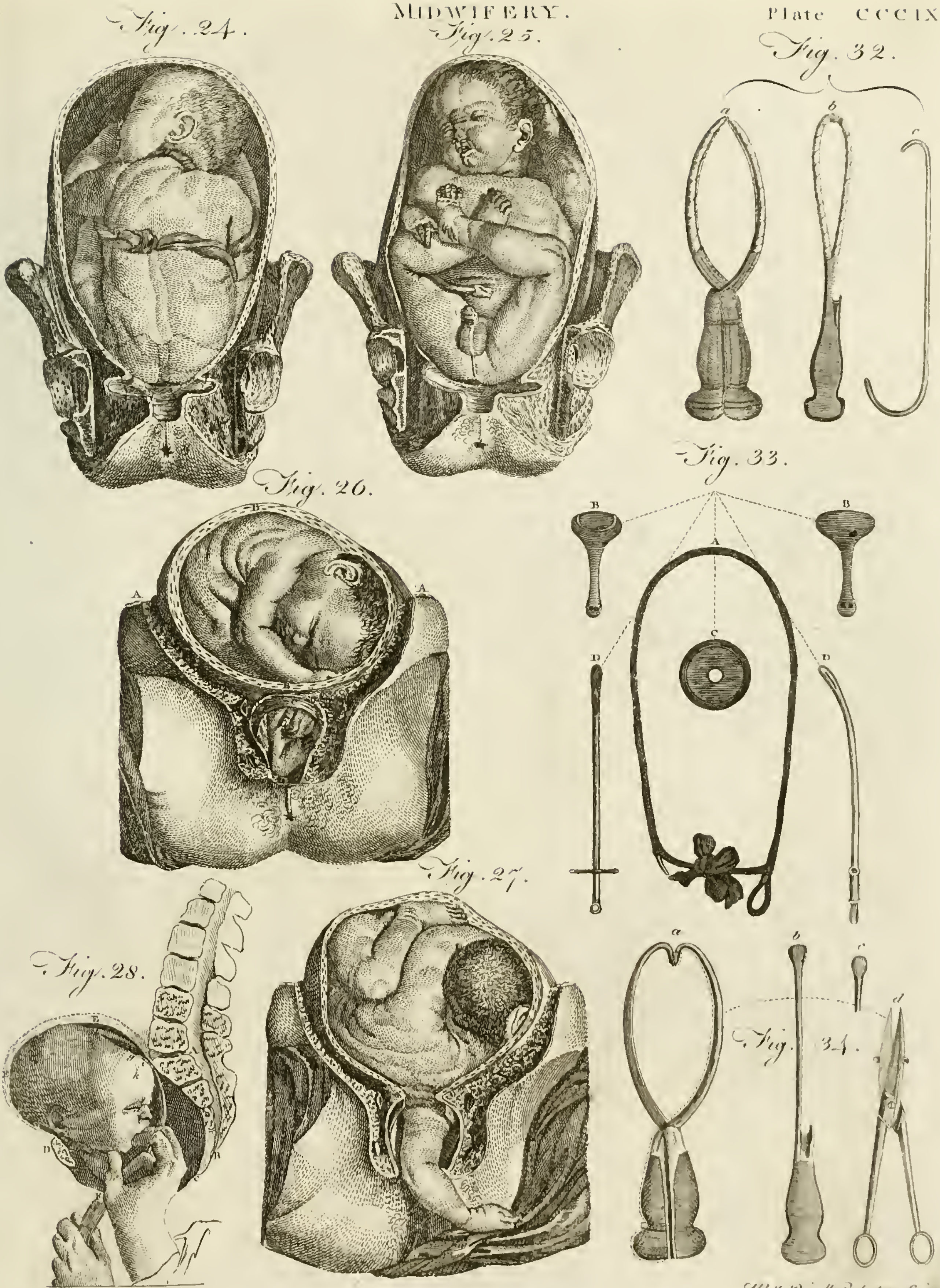
c, A front view of the point, to fhow its proportional length and breadth.

d, The fciffars for perforating the cranium in very narrow and diftorted pelvifes. They ought to be made very ftrong, and at leaft nine inches in length, with ftops or refts in the middle of the blades, by which a large dilatation is more eafily made.

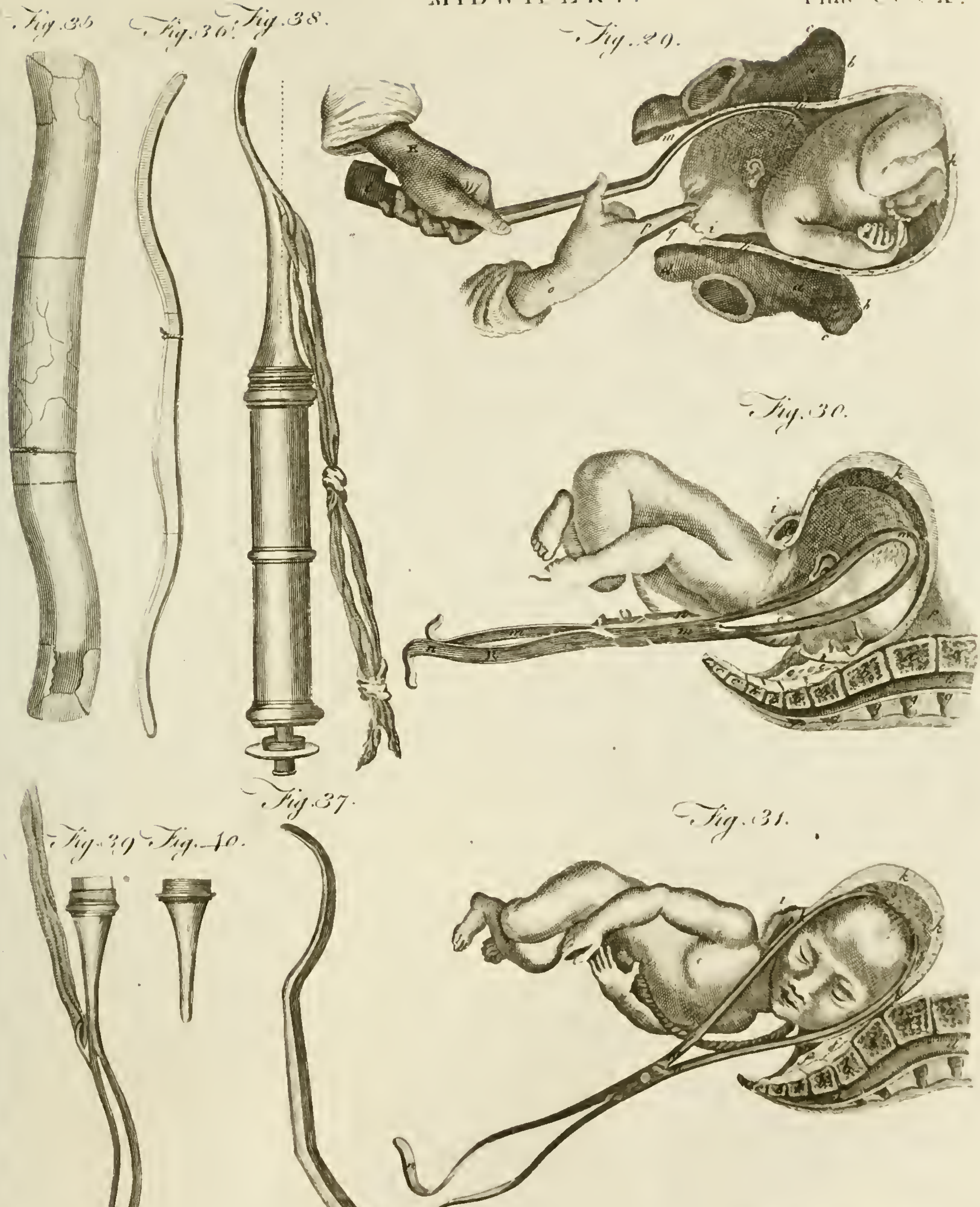
Plate CCCX. fig. 35. gives an anterior view of the improved lever by Roonhuyfen, an inftrument now come into confiderable reputation. Fig. 36. fhows the fame in profile. Fig. 37. the lever recommended by M. Baudelocque. Fig. 38. one of the blades of a lever recommended by M. Herbinaux, fixed in the handle. Fig. 39. an anterior view of the fame blade with the ftrap. Fig. 40. the fpout of the fyringe, when the inftrument is ufed for injecting oil, or any other liquid into the uterus. The following is a general defcription of Roonhuyfen's lever, with the method of ufing it, as given by M. Preville, and added to his edition of Smellie's Midwifery. "The lever is an oblong piece of iron, 11 inches long, one broad, and about an eighth of an inch in thicknefs, it is ftraight in its middle for four inches, and becomes gradually curved at each extremity: the curves are of different lengths and depths; the edges are rounded; and the extremities for the fpace of an inch, and alfo the middle of the inftrument, are directed to be covered with plafter, and then the whole of it to be fheathed with thin dogfkin; taking care to avoid inequalities or folds, which might injure the woman or child. In ufing it, the accoucheur muft introduce the fore-finger of his left hand into the vagina near the anus, to ferve as a guide for the inftrument, which muft now be gently infinuated between his finger and the head of the child, taking care that no part of the uterus be included between the lever and the head. The inftrument muft then be moved to the right and to the left, to find where there is the greateft fpace, and in fome degree to loofen and difengage the head; and then gradually carried round, until it comes under the pubes, lifting the end of it from time to time, to obtain a freer paffage. The handle of it muft now be raifed, and the inftrument gently fhifted about, until the occiput is exactly lodged in its curve. The more completely and exactly the curve touches and embraces the head, the more fpeedily and eafily the delivery will be effected. The inftrument being thus firmly and equally applied to the head, the accoucheur muft flowly and uniformly raife the handle with his right hand, while with his left he preffes the middle of it downward; by this means the coccyx is forced backward, and the lower part of the pelvis is enlarged. By continuing to raife the handle of the lever and to prefs down its middle or centre, the head of the child is made to defcend into the dilated cavity of the vagina: and this is commonly effected in a few minutes; when the left hand muft be applied firmly againft the anus and perinæum, forcing thofe parts upwards and forwards towards the orifice of the vagina, to prevent laceration; for which purpofe alfo the whole operation muft be performed flowly and cautioufly, imitating as much as poffible a natural labour."

"We found (add the authors of the paper,) a cord fixed round one of the ends of the inftrument, about the middle of the curve. This cord, we imagine, ferved no other purpofe than to point out the end of the inftrument commonly made ufe of, or to meafure the length of the part introduced."

END OF THE ELEVENTH VOLUME.



A. Bell Prin. Wal. Sculptor fecit.



A. Bell Prin. Wal. Sculptor fecit.

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ERRATUM.

In Vol. VIII. col. 2. marg. note 66. For *inferiority*, read *superiority*.